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Sensitive Animal Species in the Elkhorn and Big Belt Mountains of the Helena National Forest

A Report to

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INTRODUCTION

The maintenance of biodiversity and ecological processes is a topic that has generated considerable interest over the past decade (Harris 1984, Noss 1990, Saunders et al. 1991). Most researchers feel that biodiversity and the functioning of ecosystems are interdependent without always agreeing on the definition of one or more of the terms (Franklin et al. 1981, Franklin 1988, Noss 1990). Franklin (1988) characterized ecosystems as being composed of three attributes: composition, structure, and function. These attributes, their sum, and their interactions ultimately define the biodiversity of an area (Noss 1990). If the former triad is conserved, it is hoped that the conservation of biodiversity will naturally follow. Much of the responsibility for this conservation rests with federal and state agencies. These organizations control a significant portion of the total land area of the United States and one of the most important of these agencies is the United States Forest Service (USFS).

The USFS manages approximately 77 million hectares of public lands within 43 of the 50 states, accounting for over eight percent of the total land mass of the United States. In 1990, the USFS began implementing research and management strategies that were designed to sustain diverse, productive, and stable ecosystems under their programs entitled "New Perspectives" and "Sustaining Ecological Systems" (Salwasser 1991). The National Forest Management Act of 1976 and the 1990 Resources Planning Act Program direct the USFS to strive for the above conditions through the maintenance of biodiversity and ecological functions at varying geographical scales. This maintenance will proceed through diverse management strategies, many of which attempt to emulate natural processes (Salwasser 1991, but see Frissell et al. 1992). Stated more succinctly, the USFS hopes to maintain biodiversity in a managed landscape through a combination of natural forces and human management.

Today, the land manager/conservationist must be aware of various concepts that are becoming increasingly important in managed landscapes. Some of these topics include: 1) how to best maintain biological diversity, including community diversity over a broad landscape, habitat and structural diversity within communities, species diversity within and among habitats, and genetic diversity within species and populations; 2) understanding the importance of fragmentation, minimum patch size, patch shape, distance between patches, and dispersion of patches; and 3) assessing the importance of corridors (MacArthur and Wilson 1963, 1967, Franklin et al. 1981, Harris 1984, Simberloff and Cox 1987, Franklin 1988, Pimm et al. 1988, Lord and Norton 1990, Saunders et al. 1991, Harrison 1992).

Two of the most central themes in the field of conservation biology are the concepts of the fragmented landscape and the potential importance of corridors in connecting these habitat fragments (Harris 1984, Simberloff and Cox 1987, Soule and Kohm

1989). MacArthur and Wilson (1963, 1967) noted that insular populations of organisms are more susceptible to extinction than are mainland populations. This theory has been applied to habitat patches. Patches of habitat may be analogous to islands in the respect that they are often surrounded by areas that are inhospitable to the species they support (Johnson 1975, Brown and Kodric-Brown 1977, Cutler 1991, McDonald and Brown 1992). Patches, whether they be true islands surrounded by water, mountain ranges surrounded by deserts or prairies, or forest stands surrounded by other vegetation types, experience higher rates of extinction and may eventually suffer "faunal collapse" (Terborgh 1974, Pimm et al. 1988). Fragmented habitat blocks at varying scales are becoming increasingly common in portions of the world and have the capacity to significantly increase chances of extinctions and localized extirpations.

Many researchers have pointed to the importance of corridors in maintaining biodiversity. Corridors potentially are important components of naturally and artificially fragmented landscapes for they may provide avenues for natal dispersal, gene flow, and recolonization after localized extinction (MacClintock et al. 1977, Harris 1984, Simberloff and Cox 1987, Harrison 1992). Unfortunately, few studies have definitively determined the true effectiveness, importance, and minimum sizes for corridors (Simberloff and Cox 1987). Corridors as small as hedgerows may be important for small animals such as rodents and certain songbirds (Wegner and Merriam 1979, Middleton and Merriam 1981). For many species, however, it appears that corridors must be several orders of magnitude wider than a hedgerow and the minimum width may be dependent upon the length of the corridor. Additionally, the use of corridors depends upon the natural history of each species, whether it is predisposed to the use of corridors and whether motivation exists for individuals to emigrate along corridors (Harrison 1992). It should be realized that disadvantages such as greater risks to mortality, increased rate of disease transmission, and increased risk of fires can be associated with the presence of corridors between habitat patches (Simberloff and Cox 1987).

The national forests of today can certainly be called the "fragmented forest" and the land manager must be aware of the diversity of these fragments at varying geographic scales in order to define management protocol. Before management strategies are implemented, however, the faunal and floristic composition of the communities to be impacted must be assessed for single-species management guidelines. Landscape scale community guidelines can be very detrimental to non-target organisms. Even when single-species management is on the scale of habitat fragments, a loss of biodiversity can be caused. Extreme caution should be used when such methodology is employed. The conservation of viable populations of various species within each patch or fragment, will ultimately enhance the viability of the forest as a whole. Management of this type necessitates individual assessments and plans for each land unit that will

undergo restructured management. For the USFS, the unit of management is often the Forest Service District or National Forest.

We, at the Montana Natural Heritage Program, have been asked to assess the faunal and floristic composition of USFS lands contained in two mountain ranges located in southwestern Montana and to define management strategies for a subset of species that will maintain viable populations of each. The animals chosen all constitute species designated as "Sensitive Species" by Region 1 of the USFS (Reel et al. 1989). Sensitive Species are defined as species whose population viability is of concern due to significant current or predicted downward trends in population numbers or density, or to significant current or predicted downward trends in habitat suitability, that would result in a reduction in a species' distribution (Clark et al. 1989).

In this report, we will be applying the "fine filter" approach in the hope that the management for these sensitive species coupled with broader landscape management schemes (coarse filter approach), biodiversity will be maintained or restored.

OBJECTIVES AND GOALS

The objectives of this project are to define the habitat requirements of the Sensitive Species that are known or expected to be found in the Elkhorn and Big Belt Mountains on the Townsend Ranger District, Helena National Forest. Existing information that is applicable to the study area and sensitive species is compiled to provide habitat relationships and management recommendations for each species. Through description of suitable habitats and the prescription of management schemes to maintain these habitats, it is hoped that viable populations of these species will be maintained, enhanced, or recovered. This management style fits within the framework of the "fine-filter" approach and complements the "coarse-filter" approach to management of landscapes.

STUDY AREA

The study area consists of portions of the Elkhorn and Big Belt Mountains in southwest Montana (Figure 1). Both sections of the study area are administered by the Townsend and Helena Ranger Districts of the Helena National Forest. Approximately 280 species of vertebrates and 700 species of vascular plants occur here (Appendix 4, Heidel and Poole 1993).

The Elkhorn Mountains are oriented relatively north-south, and located to the south of Helena and the west of Townsend. They measure approximately 40 km in length by 35 km in width. Approximately 65,000 ha of USFS lands are located in the Elkhorns with additional acreage in public ownership under Bureau of Land Management (BLM) administration (USFS 1992). The USFS, BLM, and Montana Department of Fish, Wildlife and Parks (MDFWP) signed a joint Memorandum of Understanding in June 1992 which designated much of this mountain range as the Elkhorn Cooperative Management Area (USFS 1992). The Elkhorn Cooperative Management Area will be managed as an ecological unit to sustain ecological systems and conserve biodiversity (USFS 1992).

The Elkhorn Mountains are very diverse in their geologic formation, soils, topography, and climate (USFS 1992). This range, therefore, supports a very diverse assemblage of plant and animal communities. Elevation in the Elkhorns ranges from 4600 ft (1480 m) to 8600 ft (2770 m). The climate is characterized as a modified continental climate. The major modifying factors are frequent invasions of moist Pacific air masses, protection of valleys by adjacent mountains, and the migration of cool air from the mountains into the valleys (USFS 1992).

The Big Belt Mountains, located to the east of the Missouri River, run for approximately 90 km in a northwest-southeast direction. This range averages 15 km wide and may potentially be viewed as a peninsular form or a portion of a corridor connecting the southern portion of the Northern Rocky Mountain Ecosystem with the northern portion of the Greater Yellowstone Ecosystem.

Like the Elkhorn Mountains, the Big Belt Mountains experience a modified continental climate. They range in elevation from 1190 m (3700 ft) to 3060 m (9500 ft) and are a geologic mix of sedimentary, metasedimentary, and igneous rock.

The Elkhorn Mountains exemplify an island of montane communities surrounded by a sea of sagebrush steppe and grasslands. Other forested habitat lays to the west about 20-30 km in the main Rocky Mountains and to the east 30 km in the Big Belt Mountains. Since the Elkhorns are insular in nature, the populations of organisms that inhabit this range may suffer the same limitations that are associated with island faunal assemblages, namely high extinction rates and reduced gene flow. If populations are small and isolated, random genetic drift and inbreeding may become important. Depending upon the species in question, there are potential sources of recolonization and gene flow through immigration.

Since the Big Belt Mountains can be viewed as a peninsula,

the populations contained within them are probably less vulnerable to local extinctions than are the same species in the Elkhorn Mountains to the west. Potential sources for dispersal into the Big Belts are as near as 30 km (Bridger Mountains and Castle Mountains) and as far away as 60 km (Scapegoat Wilderness Area). The Big Belt Mountain are fairly wide and, if the corridor is not broken by blocks of unsuitable habitat that are too large, mobile species may use this mountain range as a travel corridor (Simberloff and Cox 1987, Harrison 1992).

Mobile forest-dwelling species such as nonmigratory songbirds, raptors, and carnivores may disperse into the Elkhorns, a distance of approximately 20-30 km from the Continental Divide or a distance of 30 km from the Big Belts. This dispersal would require movement by individuals across unsuitable and sometimes hostile habitats. The probability of dispersal into the Elkhorns and travel through the Big Belts certainly depends upon the distance to the source population, the mobility of the species in question, and whether motivation exists for movement. Additionally, social facilitation of this movement may be important for some species. These species would be more likely to move into this mountain island if conspecifics were already present (Smith and Peacock 1990).

Migratory forest species may more readily recolonize the Elkhorn Mountains following local extinction events and gene flow may be high between populations depending upon site fidelity, reproductive ecology, and migratory routes. These same species may more readily use the Big Belt Mountains as a travel corridor during their spring and fall migrations. Many songbirds, migratory hawks, and flammulated owls may fit into this category to varying degrees.

Relatively immobile forest organisms such as small mammals, reptiles, amphibians, and arthropods may experience more difficulty in recolonizing the Elkhorn Mountains or travelling through the Big Belts. If species with very narrow habitat breadth (such as the northern bog lemming or red-backed vole) become extirpated from an insular mountain range or habitat fragment, recolonization may never occur (Simberloff and Cox 1987).

Most shrub-steppe and grassland organisms in southwest Montana have several source populations for gene flow and recolonization. Migratory species such as the ferruginous hawk and mountain plover seek suitable habitat as they settle on breeding territories in the spring. Even if site-fidelity is strong, individuals of these species have the options of foregoing breeding activity or moving on to other available habitat found in or along the broad river valleys. Relatively non-mobile shrub-steppe and grassland species such as sagebrush voles (Lagurus curtatus) and tenebrionid beetles may experience localized extinctions. Recolonization may occur relatively rapidly in comparison to more montane species because source populations may be separated by only a relatively short distance.

Over the past 14,000 years certain species in both mountain

ranges have undoubtedly undergone local extinctions and recolonizations. These oscillations followed the ebb and flow of alpine communities, coniferous forests, shrub-steppe, and grasslands as they responded to changes in climate (USFS 1992). Sources for recolonization did, and in many cases do, exist for the faunal assemblages of the Elkhorns and the Big Belt Mountains. However, the insular nature of these ranges must be kept in mind when making land management decisions which may impact the size and distribution plant and animal populations.

Figure 1. Map of the Elkhorn and Big Belt Mountains, Helena National Forest.

METHODS

We determined, with Kathy Bulchis of the Helena National Forest, that nine Forest Service Region 1 Sensitive Species (terrestrial vertebrates) are known or potentially occur in the Elkhorn or Big Belt Mountains. These include: Townsend's big eared bat, northern bog lemming, wolverine, lynx, ferruginous hawk, mountain plover, black-backed woodpecker, boreal owl, and flammulated owl. Initial literature reviews and habitat information was gathered on these nine vertebrate species. Species habitat characterization abstracts, similar to a linear model for habitat relations, were prepared for each species. These included information on the type of forest used by the vertebrate and associated forest/grassland species of the selected forest type, elevation and slope.

These habitat characterization abstracts were coded into the parameters of the Timber Stand Management Record System (Chapter 100, Timber Management Control Handbook). This included choosing appropriate habitat type, forest type, diameter at breast height (dbh) for the dominant tree species, percent canopy closure, elevation and size of contiguous habitat required by each species.

To determine what stands (polygons) were appropriate habitat, queries were made of the Forest Service Timber Stand Data Base (FSTSDB) using the coded information from the habitat characterization abstracts. The FSTSDB contains information on forest type, soils, aspect, slope, elevation, field determined habitat type, habitat type as determined by photo interpretation (PI habitat type), average dbh and height for major tree species, percent canopy cover, trees per acre, damage type and severity, any current or past activities (logging, planting, etc.) occurring within the stand, and forest strata type as determined by photo interpretation (PI strata type, this incorporates forest type and average DBH and height). However, 40-60% of the stands are incomplete or not field verified.

A separate query was made for each vertebrate species. These queries were limited by one or all of the following parameters: field habitat type, PI habitat type, PI strata type, aspect, slope, and elevation. They also reported the following information (when available): average DBH and height, damage type and severity, aspect, trees per acre, and forest year of origin.

Maps were developed to visually display the records (polygons) selected through the stand data base queries. With these maps as a guide, aerial photos were studied to help determine if the polygons contained suitable habitat. Suitability of habitat was verified with site visits for some areas. The query parameters and the results are presented in Appendix 1 & 2.

After realizing the queries were providing inaccurate and/or insufficient information, we developed alternative ways to gather information. The possibility of using East-side Montana Zone: Old Growth Type Codes was studied. These "type codes" are old growth

definitions as described in "Old-Growth Forest Types of the Northern Region" (Green et al. 1991), and are currently being tested in an old growth study on the Helena National Forest. For the boreal and flammulated owls, which have habitat needs found in old growth stands, queries were run using these definitions. As with the previous queries, maps of the selected polygons were developed and aerial photos studied to determine the suitability of the chosen habitat.

Aerial photos with strata delineations were also studied to determine the applicability of using these strata to define wildlife habitat without relying on other habitat parameters. Efforts were made to describe the habitat for these nine species using only the strata types. This approach will provide polygons of both appropriate and inappropriate habitat because of their general nature, but may provide a starting point for field reconnaissance.

RESULTS AND DISCUSSION

Computer Models and Maps

Maps generated with models in conjunction with the FSTSDB were generally unsatisfactory for sensitive species management applications. They contained both suitable and unsuitable habitat. This was the result of the limitations in structure and searching capabilities of the data base. Certain limiting habitat parameters were out of the scope of the data base, necessitating the use of broadly written habitat descriptions which selected both appropriate and inappropriate habitat. In addition, appropriate habitat was not chosen in some cases. This was the result of not having stand data for many areas of the forest.

Based on our use of the Forest Service's Timber Stand Data Base in selecting wildlife habitat, the following approach is suggested for Forest Service personnel to determine if a proposed action might impact wildlife habitat:

1) Determine which stands will be impacted by the proposed action.

2) Identify stand strata components and compare them with sensitive species habitat profiles and associated strata supplied by the Montana Natural Heritage Program.

3) Validate timber stand polygons with aerial photos and verify presence/absence and significance of TES (threatened, endangered and sensitive) species with site visits.

Additionally, when the old growth maps are available on the system, these should provide a good source of information about potential habitat for boreal and flammulated owls.

Ferruginous Hawk (*Buteo regalis*)

Introduction

The ferruginous hawk is the largest buteo in North America, historically breeding from Manitoba west to Alberta and south to Nevada, Arizona, and New Mexico. Many researchers have inferred or demonstrated that ferruginous hawk populations have declined in portions of their range and since 1982 this species has been classified under Category 2 by the United States Fish and Wildlife Service (USFWS) (Woffinden 1975, Powers and Craig 1976, Murphy 1978, Bechard 1981, Evans 1982, Houston and Bechard 1984, Schmutz 1984, Schmutz *et al*. 1984, Woffinden and Murphy 1989, USFWS 1992).

The status and viability of ferruginous hawks in Montana is little known with studies to date centered in extreme southeastern, extreme southwestern, and north-central Montana (Ensign 1983, Myers 1987, Restani 1989, 1991, Harmata 1991, Wittenhagen 1991, 1992, Atkinson 1992, Black 1992). Montana appears to support a relatively stable population of breeding ferruginous hawks, second in size only to Wyoming in the United States (Ure *et al*. 1991, USFWS 1992).

Habitat

Ferruginous hawks are associated with native short-grass prairies and, to a lesser extent, desert shrublands. This preference for breeding in structurally simple grasslands is a function of both their morphology (large body size coupled with long broad wings adapted for slow low-level flight and soaring) and prey selection. Ferruginous hawks prey largely upon ground squirrels (*Spermophilus* sp.), northern pocket gophers (*Thomomys talpoides*), jackrabbits (*Lepus* sp.), and fledgling passerines such as Western Meadowlarks (*Sturnella neglecta*), Sage Thrashers (*Oreoscoptes montanus*), and Horned Larks (*Eremophila alpestris*); all species found in grasslands and the shrub steppe (Ensign 1983, Restani 1989, 1991, Johnsgard 1990, Atkinson 1992).

Ferruginous hawks are quite variable in their choice of nest sites, nesting in trees and shrubs, on power poles, cliffs, bluffs, rocky outcrops, eroded hillsides, and even upon the ground itself. Throughout the species range, lone trees or trees situated near the end of stringers extending onto valley floors are chosen for nesting. When nesting upon rocky outcrops, bluffs, cliffs, and steep hillsides, ferruginous hawks usually select sites with a southerly exposure (Smith and Murphy 1982, Ensign 1983, Myers 1987, Atkinson 1992).

Unlike the nest substrate itself, vegetation surrounding the nest is less variable. In Montana, grass-dominated communities characteristically predominate over other community types surrounding ferruginous hawk nests. These communities account for nearly 50% of the habitat within 1.6 km of active and inactive nests, the remainder being composed of shrub-dominated

communities and mosaics of grasses and shrubs. Areas consisting of shrub/grass mosaics appear to be important in determining whether individual nests are used by ferruginous hawks. Mosaic quantity within 1.6 km and mosaic quantity and coverage within 100 m of active nests were significantly greater than those values surrounding inactive nests (Atkinson, unpubl. data). Vegetation height surrounding nests is relatively short, with grasses and shrubs averaging 37 and 73 cm in height respectively.

Breeding pairs of ferruginous hawks apparently require a substantial area surrounding their nest in which to forage. Estimates for mean home range sizes range from 5.9 km^2 in shrub steppe areas of Utah (Smith and Murphy 1973) to 7.6 km^2 in the Snake River Birds of Prey Area of southwestern Idaho (McAnnis 1990). In most areas, breeding pair density does not approach levels of saturation and density between populations can be extremely variable (Ensign 1983, Myers 1987, Restani 1989, Harmata 1991, Atkinson 1992). Several researchers have noted, however, that actual densities are quite variable between portions of their respective study areas with portions of apparently suitable habitat remaining unoccupied while other areas support very closely packed territories (Fitzner et al. 1977, Atkinson 1992).

Using Maps

Elkhorn Mountains: Based upon analysis of potential vegetation types, percentages of each type potential vegetation type, and average patch-size of each potential vegetation type, ferruginous hawks may be expected to occur in the following land-type associations (LTA) of the Elkhorn Wildlife Management Unit (LTA followed by the potential vegetation or physiographic feature that makes the LTA appropriate for this species): 1 (grass/shrub), 2 (grass/shrub with break lands), 3 (grass/shrub), 4 (grass/shrub), and 11 (grass/shrub on hogback benches).

Big Belt Mountains: Based upon analysis of potential vegetation types, percentages of each type potential vegetation type, and average patch-size of each potential vegetation type, ferruginous hawks may be expected to occur in the following land-type associations (LTA) of the Big Belt Mountains (LTA followed by the potential vegetation or physiographic feature that makes the LTA appropriate for this species): 3 (grass/shrub), 4 (grass/shrub), and 11 (grass/shrub on benches).

Surveying and Monitoring

Surveys for ferruginous hawks may be performed during each of several portions of the breeding season. Early season surveys beginning in early April when birds arrive and continuing until the period of egg laying work well for determining territory establishment and occupancy. However, ferruginous hawks are extremely sensitive to disturbance during this portion of their breeding season and researchers should be extremely cautious in

approaching nests. Late season surveys initiated in early June and extending to mid-July may yield information on productivity and nesting success but surveys at this time may underestimate the actual number of ferruginous hawks that attempt to breed in any one year or area.

Surveys performed in vehicles coupled with foot surveys are often quite successful in locating ferruginous hawk nests. During each type of survey, trees (especially lone trees and those at the ends of stringers), rocky outcrops, cliffs, eroded stream banks, and steep hillsides should be examined with binoculars or a spotting scope. Nests in conifers or deciduous trees with leaves are often difficult to locate and it may be necessary to check individual trees for the presence of nests. Nests on the ground and easily accessible outcrops should not be approached since such activity can cause abandonment by breeding ferruginous hawks and may also increase the risk of predation (Olendorff 1973, Ensign 1983, Gaines 1985).

To adequately assess the viability of ferruginous hawk populations territory occupancy and productivity of known nesting territories should be studied over the period of several years in order to allow time for recruitment and response to environmental changes. Once territories are discovered they are easily resurveyed in following years to determine occupancy and productivity.

Management Strategies

Since grassland habitat is critical for the viability of ferruginous hawk populations, every effort should be made to maintain grassland communities in their natural state. Managers should strive to emulate natural processes which result in a high vegetative diversity. Areas of shrub/grass mosaics should be retained. If grassland communities are maintained near their natural condition, prey species are available, and actively nesting hawks are not disturbed, ferruginous hawks may successfully reproduce on the periphery of the Helena National Forest. Following the guidelines below will increase the suitability of the area for breeding ferruginous hawks.

1. Once ferruginous hawk territories are located every effort should be made to reduce disturbance to the nesting birds. Human activity should be discouraged within a radius of 450 m surrounding active nests by posting these areas off-limits to human intrusion. Grazing lessees should be educated regarding the sensitivity of ferruginous hawks and be advised to keep their activities in active territories to a minimum.

2. Lone trees and those in stringers may be damaged by cattle seeking shade, hence, if nests are located in trees on grazing allotments these trees should be protected from the activity of cattle. Such protective measures may include erecting an exclosure around the nest tree.

3. Prescribed burning procedures in grassland habitats can increase the suitability for ferruginous hawks by reducing the amount of woody vegetation.

4. Additionally, moderate levels of grazing may benefit this species by decreasing cover and, hence, increasing prey vulnerability.

5. Introduction of exotic and invasive plant species should be discouraged while attempting to maintain plant communities with high diversity which in turn support diverse and abundant prey communities.

6. Artificial nest structures have been used with considerable success in many areas to increase ferruginous hawk nesting density. Caution should be exercised when placing artificial nest structures, to reduce their susceptibility to disturbance. Nest platforms should be placed at least 500 m from occupied dwellings, gates, salt licks, springs, and other frequently visited sites. To reduce the visibility of these structures to humans nest platforms should be erected in depressions in the landscape (Schmutz 1984).

Literature Cited

Atkinson, E.C. 1992. Ferruginous Hawk Inventories on the Dillon Resource Area of southwest Montana, 1992. Mont. Nat. Heritage Prog., Helena 34 pp.

Bechard, M.J. 1981. Historical nest records for the ferruginous hawk in Manitoba. Can. Field-Nat. 95:467-469.

Black, A. 1992. Ferruginous hawk reproduction and habitat survey. Challenge Cost Share Rep., Bur. Land Manage., N. Rockies Conserv. Coop., Jackson, Wyo. 30 pp.

Ensign, J.T. 1983. Nest site selection, productivity, and food habits of ferruginous hawks in southeastern Montana. M.S. thesis. Mont. St. Univ., Bozeman. 83 pp.

Evans, D.L. 1982. Status reports on twelve raptors. Spec. Sci. Rep.--Wildl. No. 238. U.S. Fish Wildl. Serv., Washington, D.C. 70 pp.

Fitzner, R.E., D.Berry, L.L. Boyd, and C.A. Rieck. 1977. Nesting of ferruginous hawks (Buteo regalis) in Washington, 1974-1975. Condor 79:245-249.

Gaines, R.C. 1985. Nest site selection, habitat utilization, and breeding biology of the ferruginous hawk in central North Dakota. M.S. Thesis, N. Dak. St. Univ., Fargo. 32 pp.

Harmata, A.R. 1991. Impacts of oil and gas development on raptors associated with Kevin Rim, Montana. Unpubl. Rep. Mont. St. Univ., Bozeman. 97 pp.

Houston, C.S. and M.J. Bechard. 1984. Decline of the ferruginous hawk in Saskatchewan. Amer. Birds 38:166-170.

Johnsgard, P.A. 1990. Hawks, eagles, and falcons of North America. Smithsonian Inst. Press, Washington, D.C. 403 pp.

McAnnis, D. 1990. Home range, activity budget and habitat use of ferruginous hawks (Buteo regalis) breeding in southwestern Idaho. M.S. thesis. Boise State Univ., Boise, Idaho. 81 pp.

Myers, L.H. 1987. Nesting ecology of ferruginous hawks in S.W. Montana. Paper presented at the Mont. Nongame Symp., Kalispell, Mont. Feb. 11, 1987. 14 pp.

Murphy, J.R. 1978. Management considerations for some western hawks. Trans. N. Amer. Wildl. Nat. Resour. Conf. 43:241-251.

Olendorff, R.R. 1973. Ecology of the nesting birds of prey of northeastern Colorado. U.S. Internat. Biol. Prog., Grassland Biome, Fort Collins, Col. Tech. Rep. No. 211. 233 pp.

Powers, L.R. and T.H. Craig. 1976. Status of nesting ferruginous hawks in the Little Lost River Valley and vicinity, southeastern Idaho. Murrelet 57:46-47.

Restani, M. 1989. Resource partitioning among three species of hawks in the Centennial Valley, MT. M.S. thesis. Mont. St. Univ., Bozeman. 86 pp.

Restani, M. 1991. Resource partitioning among three Buteo species in the Centennial Valley, Montana. Condor 93:1007-1010.

Schmutz, J.K. 1984. Ferruginous hawk and Swainson's hawk abundance and distribution in relation to land use in southeastern Alberta. J. Wildl. Manage. 48:1180-1187.

Schmutz, J.K., R.W. Fyfe, D.A. Moore, and A.R. Smith. 1984. Artificial nests for ferruginous and Swainson's hawks. J. Wildl. Manage. 48:1009-1013.

Smith, D.G. and J.R. Murphy. 1973. Breeding ecology of raptors in the eastern Great Basin of Utah. Brigham Young Univ. Sci. Bull. Biol. Ser. 18(3):1-76.

Smith, D.G. and J.R. Murphy. 1982. Nest site selection in raptor communities of the eastern Great Basin. Great Basin Nat. 42:395-404.

Wittenhagen, K.W. 1991. 1991 progress report on the ferruginous hawk in southeastern Montana. Unpubl. Rep. U.S. Bur. Land Manage., Miles City, Mont. 24 pp.

Wittenhagen, K.W. 1992. Final report on the ferruginous hawk in southeastern Montana. Unpubl. Rep. U.S. Bur. Land Manage., Miles City, Mont. 31 pp.

Woffinden, N.D. 1975. Ecology of the ferruginous hawk (Buteo regalis) in central Utah: population dynamics and nest site selection. M.S. thesis. Brigham Young Univ., Provo, Utah. 102 pp.

Woffinden, N.D. and J.R. Murphy. 1989. Decline of a ferruginous hawk population: A 20-year summary. J. Wildl. Manage. 53:1127-1132.

Ure, J., P. Briggs, and S.W. Hoffman. 1991. Petition to list as endangered the ferruginous hawk (Buteo regalis), as provided by the Endangered Species Act of 1973, as amended in 1982. Ferruginous Hawk Project, Salt Lake City, Utah. 9 pp.

U.S. Fish and Wildlife Service. 1992. Endangered and threatened wildlife and plants; notice of finding on petition to list the ferruginous hawk. Fed. Register 57(161):37507-37513. Aug. 19, 1992.

Mountain Plover (*Charadrius montanus*)

Introduction

The mountain plover is a small shorebird weighing approximately 110 g, historically found ranging over much of the Great Plains (Bent 1929, Olson 1984). Unlike other North American shorebirds, mountain plovers are associated with arid short-grass prairies for both breeding and wintering and are not tied to perennial or ephemeral bodies of water.

Mountain plovers are insectivorous with ground beetles such as carabids and darkling beetles (*Eleodes* sp., Tenebrionidae) comprising 60% of the insects taken, followed in importance by grasshoppers and crickets (25%) (Orthoptera) and ants (6.6%) (Hymenoptera) (Baldwin 1971). The proportion of grasshoppers and ants increased during late summer. Mountain plovers forage by alternating periods of running or walking with periods spent scanning the ground for insects (Laun 1957, Baldwin 1971).

Mountain plovers arrive on their breeding grounds in early April and spend a considerable amount of time flying over and between areas of suitable habitat (Craig Knowles, pers. comm.). Females commence egg laying within 6 weeks. Incubation typically lasts 29 days and the young remain dependent for 33-34 days or until mid-July (Graul 1975, Olson 1984). At this time, mountain plovers gather in flocks that travel between prairie dog towns or other areas of suitable habitat (Graul 1973, 1975; Knowles *et al*. 1982).

The United States Fish and Wildlife Service currently lists the mountain plover as a "Category 2" species in light of 50-89% declines in numbers over much of its range (Leachman and Osmundson 1990). It is likely that this species will be moved to Category 1 and proposed for listing as Federally threatened or endangered within the next year (F. Knopf pers. comm.)

Habitat

Mountain plovers are extremely narrow in their habitat use, a characteristic that has made this species very susceptible to local and wide-scale extirpation. Breeding plovers are almost inevitably associated with areas of extremely short native grasslands exhibiting substantial amounts of bare ground (Graul 1975, Graul and Webster 1976, Knowles *et al*. 1982, Olson 1984, Olson and Edge 1985, Olson-Edge and Edge 1987). Additionally, areas used by mountain plovers are usually flat with slopes generally less than 12% (Graul 1975, Knowles *et al*. 1982, FaunaWest Wildlife Consultants 1991).

In central Montana, mountain plovers show a very strong disposition to inhabit black-tailed prairie dog (*Cynomys ludovicianus*) towns within the big sagebrush (*Artemisia tridentata*)/blue grama (*Bouteloua gracilis*) habitat type (Knowles *et al*. 1982, Olson-Edge and Edge 1987). Horizontal visibility was greater within prairie dog towns that were used by plovers,

than in adjacent areas which resulted from activities of the rodents which kept vegetation clipped short and increased the amount of bare ground. Owing to the high percentage of bare ground, burrows for refugia, and the high diversity of forbs, ground dwelling insects are more available within towns than in adjacent areas (Olson 1985). A combination of these factors apparently favors mountain plovers (Knowles et al. 1982, Olson 1985). Knowles et al. (1982) reported that mountain plovers will use prairie dog towns as small as 3 ha. The optimal sized towns inhabited by plovers is probably considerably larger as documented by Knowles and Knowles (1984) for the Ft. Belknap Indian Reservation in north-central Montana where average town-size selected was 57.5 ha. Olson-Edge and Edge (1987) showed that the optimal sizes of towns on the Charles M. Russell National Wildlife Refuge inhabited by plovers ranged from 6-50 ha.

Similarly, in central and southwestern Montana, southeastern Wyoming, and northeastern Colorado, areas where mountain plovers are not associated with prairie dog towns, breeding birds are found in areas where vegetation height is less than 10 cm (Giezentanner 1970, Graul and Webster 1976, FaunaWest Wildlife Consultants 1991, Craig and Pam Knowles, pers. comm.). Often the short-grass communities chosen by breeding plovers consist of blue grama, buffalo grass (Buchloe dactyloides), low shrubs, and open areas such as alkali flats; in many cases these areas have a history of intense grazing (Giezentanner 1970, Graul and Webster 1976, Knowles et al. 1982, Leachman and Osmundson 1990). In central Montana, FaunaWest Wildlife Consultants (1991) found 8 of the 10 mountain plover observations that they documented occurred in heavily grazed short-grass prairie within the needle-and-thread grass (Stipa comata)/blue grama habitat type. Statewide, 75% of mountain plover observations during 1991-1992 occurred in this habitat-type and this habitat-type contained 100% of the plover observations occurring in southwest Montana (Craig and Pam Knowles, pers. comm.). Junegrass (Koleria cristata), western wheatgrass (Agropyron smithii), fringed sagewort (Artemisia fridgida), broom snakeweed (Gutierrezia sarothrae), plains prickleypear cactus (Opuntia polycantha), Hood's phlox (Phlox hoodii), sedge (Carex sp.), and fleabane (Erigeron sp.) were commonly noted at mountain plover locations (FaunaWest Wildlife Consultants 1991).

Using Maps

Based upon analysis of potential vegetation types, percentages of each type potential vegetation type, and average patch-size of each potential vegetation type, mountain plovers potentially occur in the following land-type associations (LTA) of the Elkhorn Wildlife Management Unit (LTA followed by the potential vegetation or physiographic feature that makes the LTA appropriate for this species): 2 (grass/shrub on benches), 4 (grass/shrub on alluvial fans and flat uplands), and 11

(grass/shrub on alluvial fans).

Big Belt Mountains: Based upon analysis of potential vegetation types, percentages of each type potential vegetation type, and average patch-size of each potential vegetation type, mountain plovers occur in the following land-type association (LTA) of the Big Belt Mountains (LTA followed by the potential vegetation or physiographic feature that makes the LTA appropriate for this species): 11 (grassland composed of bluebunch wheatgrass/blue grama).

Surveying and Monitoring

All areas with more than 16 ha (40 acres) (Craig Knowles, pers. comm.) of suitable habitat (i.e. level short-grass prairie areas, black-tailed prairie dog towns, salt-licks, old livestock holding areas, Richardson's ground squirrel concentrations, and stock-watering centers) should be assessed for the presence of mountain plovers. Surveys should be performed in June and July (before 1 August)(FaunaWest Wildlife Consultants 1991). Surveys are efficiently performed by driving (vehicle and/or ATV) along gravel roads, jeep trails, and trails between 5-15 mph (FaunaWest Wildlife Consultants 1991). Areas of short vegetation and high bare ground coverage should be observed with binoculars and/or a spotting scope and surveyed on foot. Once mountain plovers are observed they should not be approached to avoid causing nest desertion and should only be viewed from a distance. Surveys of potential habitat should be performed each year to note yearly fluctuation of occupancy and number of mountain plovers present.

Productivity should be ascertained for any breeding pairs located. Again, caution should be exercised when approaching plovers so than pairs are not unduly disturbed. Number of plovers hatched should be recorded with the understanding that only 50% of these young will survive to independence (33-34 days) (Graul 1975). Vegetation measurements (including vegetation height, percent cover by species, litter cover, and bare ground) centered at the nest can be taken after hatching or nest failure to add to information to develop management schemes to better provide suitable mountain plover breeding habitat. Additionally, timing and intensity of grazing, distance to hiding cover, roads, and water should be noted for each mountain plover encountered.

Management Strategies

As noted above, several authors have shown that mountain plovers are closely associated with short vegetation and high amounts of bare ground, characteristics that are often associated with prairie dog activity and/or intense grazing by ungulates (Graul and Webster 1976, Knowles et al. 1982). Management practices that strive to emulate these vegetative parameters on level topography should provide potential breeding habitat for mountain plovers. Such practices include:

1. Maintain areas of intensive grazing in topographically level (< 10% gradient) short-grass communities.

2. Combine light or moderate grazing intensity with prescribed burning to mimic the vegetative structure arrived at through intensive grazing (Wershler 1989). This method may have the added benefit of reducing woody species which may increase under regimes of heavy grazing pressure.

3. Identify, map, and protect black-tailed prairie dog towns located on level short-grass areas to ensure that these concentrations persist.

4. Restrict off-road vehicle use in areas identified as potential mountain plover habitat from 1 April to 1 August.

5. Areas containing potential mountain plover habitat should not be converted to agriculture nor should they be subject to range improvements that increase the forage value to livestock [i.e. crested wheatgrass (Agropyron cristatum) seeding and pitting].

6. Efforts should be made in potential mountain plover habitat to reduce the likelihood of invasion by non-native species such as, but not restricted to, cheat grass (Bromus tectorum), leafy spurge (Euphorbia esula), and knapweed (Centaurea sp.).

Literature Cited

Baldwin, P.H. 1971. Diet of the mountain plover at Pawnee National Grassland, 1970-1971. U.S. Internat. Biol. Prog. Tech. Rep. No. 134.

Bent, A.C. 1929. Life histories of North American shorebirds. Part 2. U.S. Natl. Mus. Bull. 146:263-269.

FaunaWest Wildlife Consultants. 1991. Status and breeding distribution of the Mountain Plover in Montana. Unpubl. Rep., Bur. Land Manage., Billings, Mont. 62 pp.

Giezentanner, J.B. 1970. Avian distribution and population fluctuations on the shortgrass prairie of north central Colorado. Tech. Rep. 62. Grassland Biome. U.S. Internat. Biol. Prog. 95 pp.

Graul, W.D. 1973. Adaptive aspects of the mountain plover social system. Living Bird 12:69-94.

Graul, W.D. 1975. Breeding biology of the mountain plover. Wilson Bull. 87:6-31.

Graul, W.D. and L.E. Webster. 1976. Breeding status of the

mountain plover. Condor 78:265-267.

Knowles, C.J., C.J. Stoner, and S.P. Gieb. 1982. Selective use of black-tailed prairie dog towns by mountain plovers. Condor 84:71-74.

Knowles, C.J. and P.R. Knowles. 1984. Additional records of mountain plovers using prairie dog towns in Montana. Prairie Nat. 16:183-186.

Laun, C.H. 1957. A life history study of the mountain plover (Eupoda montana Townsend) on the Laramie Plains, Albany County, Wyoming. M.S. Thesis, Univ. Wyo., Laramie.

Leachman, B. and B. Osmundson. 1990. Status of the mountain plover, a literature review. U.S. Fish Wildl. Serv., Fish Wildl. Enhancement, Golden, Col. 83 pp.

Olson, S.L. 1984. Density and distribution, nest site selection, and activity of the mountain plover on the Charles M. Russell National Wildlife Refuge. M.S. Thesis, Univ. Mont., Missoula. 62 pp.

Olson, S.L. 1985. Mountain plover food items on and adjacent to a prairie dog town. Prairie Nat. 17:83-90.

Olson, S.L. and D. Edge. 1985. Nest site selection by mountain plovers in northcentral Montana. J. Range Manage. 38:278-280.

Olson-Edge, S.L. and W.D. Edge. 1987. Density and distribution of the mountain plover on the Charles M. Russell National Wildl. Refuge. Prairie Nat. 19:233-238.

Wershler, C.R. 1989. A management strategy for mountain plovers in Alberta. Proc. Prairie Cons. Endang. Sp. Workshop, Sask. Nat. Hist. Soc. and Can. Plains Res. Cntr. 5 pp.

Flammulated Owl (Otus flammeolus)

Introduction

Flammulated owls are small owls (49-96 g) breeding locally from southern British Columbia south to southern California, Arizona, New Mexico, and the mountains of Mexico. This highly migratory owl winters from central Mexico to the highlands of Guatemala and El Salvador. This species is almost entirely insectivorous, preying upon various orthopterans, noctuid moths, and coleopterans (Bent 1938, Goggans 1985, Hayward 1986, Reynolds and Linkhart 1987). Very few cases exist of flammulated owls taking vertebrate prey (Bent 1938).

Even though flammulated owls are widely distributed in western North America, relatively little is known about their breeding biology, habitat needs, and migratory patterns and timing.

Habitat

The habitat necessary to support populations of flammulated owls is comprised of the following three major components: nesting habitat, areas used for foraging, and roosting areas. Flammulated owls are secondary cavity nesters that depend upon naturally occurring or woodpecker-excavated holes in which to breed. Snags and live trees containing cavities are an important component of their breeding habitat, as well as the habitat of other secondary cavity nesters.

Habitat surrounding nests and singing male flammulated owls has been described in northeastern Oregon, Colorado, and central Idaho (Goggans 1985, Reynolds and Linkhart 1987, Atkinson and Atkinson 1990, Atkinson 1991, Moore and Frederick 1991). Nesting by flammulated owls is associated with old-growth (>200 yr) ponderosa pine (Pinus ponderosa)/Douglas fir (Pseudotsuga menziesii) stands in Colorado (Reynolds and Linkhart 1987). Other studies have reported that this species is associated with mature stands (30-50 cm dbh) of ponderosa pine (or other yellow pine species) intermixed with other conifers and hardwoods (Marshall 1939, Bull and Anderson 1978, Goggans 1985, McCallum and Gehlbach 1988), and that cut-over forest stands are avoided (Franzreb and Ohmart 1978). However, flammulated owls have been found using mature Douglas-fir forests in British Columbia (Howie and Ritcey 1987) and Idaho (Atkinson and Atkinson 1990, Moore and Frederick 1991). In southeast Idaho Atkinson (1991) recorded flammulated owls nesting in aspen stands surrounded by a diverse forest community containing mature Douglas fir, white-barked pine (Pinus albicaulis), Engelmann spruce (Picea engelmannii), and Rocky Mountain maple (Acer glabrum). Both live and dead trees have been used for nesting. Two flammulated owl nests have been described in Montana: one occurred in the Bitterroot valley near Stevensville; the second occurred in an quaking aspen (Populus tremuloides) stand on the Helena National Forest (D.L. Genter

pers. comm.).

Canopy-closure in stands supporting singing males was usually greater than 60% in west-central Idaho (Moore and Frederick 1991) whereas in northeastern Oregon canopy-closure was less than 50% (Goggans 1985). Each of three nests found in Idaho were surrounded by stands having canopy closure of less than 10% (Atkinson and Atkinson 1990, Atkinson 1991, E.C. Atkinson unpubl. data).

Nesting territories in eastern Oregon and Colorado averaged from 10.3 to 14.1 ha respectively (Goggans 1985, Reynolds and Linkhart 1987). Most territories studied contained a mixture of habitat types including mature or old-growth conifers, forest openings, and mixed conifer or aspen stands. Potential nesting habitat must have trees and/or snags containing suitable cavities in which to nest.

Secondly, foraging habitat is important for flammulated owls. Flammulated owls forage upon insects by drop-pouncing from elevated perches, hawking, and hover-gleaning. In eastern Oregon, flammulated owls were shown to forage predominantly in forest stands with low stem density and along the edges between forest stands and grasslands (Goggans 1985). These old-growth stands were preferred foraging areas whereas young (<100 yr) denser stands of mixed conifers were avoided. Open forests and ecotones may support large numbers of potential prey (i.e. insects) and these prey may be more active and readily available within these habitat types.

Roosting habitat is the third important component of flammulated owl habitat. Flammulated owls, like other owls, may experience difficulty thermoregulating on hot summer days (Ligon 1968). Owls, therefore, often seek dense stands of conifers which provide cool microsites in which to roost (Goggans 1985, Hayward 1989, Forsman 1981). Flammulated owls roosted significantly more than expected in mixed conifer stands in eastern Oregon while avoiding mature stands of ponderosa pine (Goggans 1985). Additionally, dense conifer stands may provide concealment from diurnal predators such as accipiters, a significant factor for a small owl.

Male flammulated owls tend to choose tall, large-diameter, live trees located near territory boundaries from which to sing (Atkinson and Atkinson 1990). These singing trees are characteristically located along ridgetops, are often surrounded by very open forest stands, and may play a vital role in the maintenance of owl territories (Atkinson and Atkinson 1990).

A mosaic of mature forest for nesting and foraging, young dense second growth stands for roosting, and grassy openings or edges for foraging has been suggested as necessary for successful flammulated owl reproduction (Goggans 1985, Reynolds and Linkhart 1987, Moore and Frederick 1991).

Using Maps

Based upon analysis of potential vegetation types,

percentages of each type potential vegetation type, and average patch-size of each potential vegetation type, flammulated owls may be expected to occur in the following land-type associations (LTA) of the Elkhorn Wildlife Management Unit (LTA followed by the potential vegetation that makes the LTA appropriate for this species): 1 (Douglas fir and riparian), 2 (Douglas fir and riparian), 3 (Douglas fir, riparian, and aspen), 4 (Douglas fir, riparian, and aspen), 5 (Douglas fir, ponderosa pine, riparian, and aspen), 6 (Douglas fir, ponderosa pine, and riparian), 7 (Douglas fir), 9 (Douglas fir, riparian), and 10 (Douglas fir, riparian, and grassland parks).

Big Belt Mountains: Based upon analysis of potential vegetation types, percentages of each type potential vegetation type, and average patch-size of each potential vegetation type, flammulated owls may be expected to occur in the following land-type associations (LTA) of the Big Belt Mountains (LTA followed by the potential vegetation or physiographic feature that makes the LTA appropriate for this species): 1 (Douglas fir and ponderosa pine), 2 (Douglas fir and ponderosa pine), and 12 (Douglas fir), 13 (Douglas fir), 14 (Douglas fir and aspen), 15 (Douglas fir), 16 (Douglas fir), 20 (Douglas fir and ponderosa pine), 21 (Douglas fir and ponderosa pine), 22 (Douglas fir), 23 (Douglas fir), and 24 (Douglas fir and aspen).

Surveying and Monitoring

Male flammulated owls respond readily to taped or vocally imitated renditions of the territorial song. Vocal imitations may be more successful in eliciting responses than taped songs (E.C. Atkinson, pers. observ.). Nocturnal calling surveys for territorial flammulated owls are most productive when performed from early May to early July (Reynolds 1987, Atkinson and Atkinson 1990). As eggs begin to hatch in early July, paired male flammulated owls become less responsive to vocalizations even though unpaired males may continue calling throughout the summer. Most surveys should be performed between 1 hour following sundown and 1 hour preceding sunup on calm nights. Since ridge lines often form boundaries between adjacent breeding territories, surveys performed along ridgetops are often most efficient in locating singing males.

Each survey should consist of a series of calling stations separated by 400-800 m (Reynolds 1987). At each station the surveyor should begin the observation period with 2-3 minutes spent listening followed by a period of calling not to exceed 1 minute. Periods of listening and calling should be alternated for at least 10 minutes before moving on to the next calling station (Reynolds 1987, R. Howie pers. comm.).

Density estimates gathered through calling surveys should be made with the realization that up to two-thirds of territorial male flammulated owls may not be paired (Reynolds 1987). Density estimates are usually reported as number of territorial males/40 ha.

Nests of flammulated owls are difficult to locate but may be found by visiting cavities within a territory during the day. As one person approaches each cavity, a second person should stay at a distance and observe the cavity opening for the emergence of an owl's face. Once the tree is reached, the first person should begin scratching on the tree's surface followed by knocking on the tree if a response is not elicited. At this point it may be necessary to climb the tree to determine if the cavity is indeed unoccupied.

Nocturnal surveys should be performed each year in areas that support flammulated owls. Actual monitoring of flammulated owl breeding activity, however, demands efforts that result in the location of nests and subsequently describing the success and productivity of these nests over a period of several years (Reynolds and Linkhart 1984).

Management Strategies

Habitat should be managed for flammulated owls through the following guidelines.

1. Mature ponderosa pine, Douglas fir, and quaking aspen stands should be retained through prescribed burning and/or selective harvest of understory species to retain or promote the open savannah-like stratification that flammulated owls prefer.

2. Large diameter (30-50 cm) snags should be retained in areas containing flammulated owls or with the potential to do so. Snag density should be maintained at 8 snags per 40 ha or higher and each snag should be greater than 1.8 m tall (Thomas et al. 1979).

3. Management should emphasize maintenance of uneven-aged stands in potential and known flammulated owl habitat. Such management may act to retain the open and multi-layered forest stands upon which this species depends for nesting and foraging.

4. Areas of dense multi-layered conifers should be retained within, and immediately adjacent to, areas managed for flammulated owls to provide diurnal roosting areas.

5. Natural openings should be retained and buffer strips of forest should be left surrounding these openings (Goggans 1985).

6. Areas with high brush cover and vegetative diversity may support high diversity of arthropods and arthropod diversity, therefore, these areas should be retained to help provide an adequate prey base for flammulated owls (Goggans 1985).

7. Do not apply insecticides in areas where flammulated owls are

present.

8. Maintain range in Good to Excellent categories in Flammulated owl habitat. This is particularly important in ponderosa pine parklands where adequate populations of insect prey species require good forb growth.

Literature Cited

Atkinson, E.C. 1991. Distribution of harlequin ducks (Histrionicus histrionicus) and common loons (Gavia immer) on the Targee National Forest. Coop. Challenge Cost Share Proj. Targee Natl. For. and Id. Dept. Fish Game.

Atkinson, E.C. and M.L. Atkinson. 1990. Distribution and status of Flammulated Owls (Otus flammeolus) on the Salmon National Forest. Coop. Challenge Cost Share Proj. Salmon Natl. For. and Id. Dept. Fish Game.

Bent, A.C. 1938. Life histories of North American birds of prey. Part 2. U.S. Natl. Mus. Bull. 170. 466 pp.

Bull, E.L., and R.G. Anderson. 1978. Notes on flammulated owls in northeastern Oregon. Murrelet 59:26-27.

Forsman, E.D. 1981. Habitat utilization by spotted owls on the Eugene District of the Bureau of Land Management. Unpubl. Tech. Rep., USDI Bur. Land Manage. Portland, Ore. 63 pp.

Franzreb, K.E. and R.D. Ohmart. 1978. The effects of timber harvesting on breeding birds in a mixed coniferous forest. Condor 80:431-441.

Goggans, R. 1985. Habitat use by flammulated owls in northeastern Oregon. M.S. Thesis, Ore. St. Univ., Corvallis. 54 pp.

Hayward, G.D. 1986. Activity pattern of a pair of nesting flammulated owls (Otus flammeolus) in Idaho. Northw. Sci. 60:141-144.

Howie, R.R. and R. Ritcey. 1987. Distribution, habitat selection, and densities of flammulated owls in British Columbia. in: Nero, R. W., C.R. Knapton, and R.J. Hamre, eds., Biology and conservation of northern forest owls: symposium proceedings. Gen. Tech. Rep. RM-142. Fort Collins, Col.: USDA For. Serv., Rocky Mountain For. Range Exp. Stat. 309 pp.

Ligon, J.D. 1968. The biology of the elf owl (Micrathene whitney). Univ. Mich. Mus. Zool. Misc. Publ. 136. 70 pp.

Marshall, J.T. 1939. Territorial behavior of the flammulated

screech owl. Condor 41:71-78.

McCallum, D.A. and F.R. Gehlbach. 1988. Nest-site preferences of flammulated owls in western New Mexico. Condor 90:653-661.

Moore, T.L and G.P. Frederick 1991. Distribution and habitat of Flammulated Owls (Otus flammeolus) in west-central Idaho. Coop. Challenge Cost Share Proj. Payette Natl. For., Wallowa-Whitman Natl. For., and Id. Dept. Fish Game.

Reynolds, R.T. 1987. Census of Flammulated Owls. Pp. 308-309. in: Nero, R.W., C.R. Knapton, and R.J. Hamre, eds., Biology and conservation of northern forest owls: symposium proceedings. Gen. Tech. Rep. RM-142. Fort Collins, Col.: USDA For. Serv., Rocky Mountain For. Range Exp. Stat. 309 pp.

Reynolds, R.T. and B.D. Linkhart. 1984. Methods and materials for capturing and monitoring flammulated owls. Great Basin Nat. 44:49-51.

Reynolds, R.T. and B.D. Linkhart. 1987. The nesting biology of flammulated owls in Colorado. in: Nero, R.W., C.R. Knapton, and R.J. Hamre, eds., Biology and conservation of northern forest owls: symposium proceedings. Gen. Tech. Rep. RM-142. Fort Collins, Col.: USDA For. Serv., Rocky Mountain For. Range Exp. Stat. 309 pp.

Thomas, J.W., R.G. Anderson, C. Maser, and E.L. Bull. 1979. Snags. pp 60-77 in: J.W. Thomas, ed., Wildlife habitats in managed forests: The Blue Mountains of Oregon and Washington. USDA For. Serv. Agric. Handbook No. 553.

Boreal Owl (Aegolius funereus)

Introduction

Boreal owls are relatively small owls with males weighing between 93-139 g (mean=117.3 g, n=50) and females substantially heavier at 132-215 g (mean=166.8 g, n=53) (Hayward and Hayward 1991). Boreal owls are circumboreal in distribution, associated with coniferous forests. This species is known as the Tengmalm's owl in Eurasia where it has been well-studied (Korpimaki 1981, Mikkola 1983, Cramp 1985). Until recently, boreal owls were thought to be rare or absent throughout much of the mountainous region of the western United States and were thought to breed rarely south of Canada. Since the early 1980's populations of boreal owls have been documented in Idaho, northeastern Washington, Colorado, Wyoming, New Mexico, and Montana (Palmer and Ryder 1984, Rogers 1986, Hayward et al. 1987, Ryder et al. 1987, Carlson 1991, Brelsford 1992a, 1992b).

Small mammals, especially microtines such as red-backed voles (Clethrionomys gapperi) and voles (Microtus sp.), make up the majority of boreal owl diets with the former species contributing up to 50% of total number of prey taken (Hayward 1989). Boreal owls take other prey such as northern pocket gophers (Thomomys talpoides), deer mice (Peromyscus maniculatus), northern flying squirrels (Glaucomys sabrinus), shrews (Sorex sp.), songbirds, and insects.

Habitat

Throughout their range boreal owls are associated with high elevation spruce-fir forest. Ninety percent of potential nest sites in Montana, Idaho, and Wyoming occurred in subalpine fir habitat types at elevations greater than 1292 m (Hayward 1989). Forest species composition, however, varies throughout the breeding range of this species (Hayward 1989).

The habitat important to boreal owls can be broken into three components: nesting habitat, areas for foraging, and roost sites. Boreal owls depend upon the presence of large naturally occurring or woodpecker-excavated cavities in which to nest (average size = 10.2 x 9.5 cm opening in trees averaging 64 cm in diameter at the nest cavity) (Hayward 1989). Cavities used by boreal owls were located from 6 to 25 m high in central Idaho and northwest Montana (Hayward 1989, Holt and Ermatinger 1989). Mature and old-growth forest stands support greater numbers of suitable cavities, therefore providing an important component of boreal owl breeding habitat.

In the Frank Church-River of No Return Wilderness Area of central Idaho, Hayward (1989) reported that singing males and nests were associated with complex multi-layered forest stands that exhibited low understory growth and a high density of mature trees. Over 90% of the nests in that study were within extensive areas of forest surrounding nest stands which averaged 7.6 ha.

In the above study, the following three habitat type series contained boreal owl nest sites: Douglas fir (Pseudotsuga menziesii/Symphoricarpos albus, Calamagrostis rubescens, and Carex geyeri) habitat types, Engelmann spruce (Picea engelmannii/Equisetum arvense) habitat types, and subalpine fir (Abies lasiocarpa/Strptopus amplexifolius, Calamagrostis canadensis, Xerophyllum tenax, and Vaccinium scoparium) habitat types.

Foraging areas with small mammals are highly important to boreal owls. Boreal owls often employ the sit-and-wait method of hunting flying short distances between perches. Habitats that support high densities of small mammals are preferred, in conjunction with relatively low ground cover which make mammals vulnerable to avian predators. Boreal owls in central Idaho apparently chose their foraging areas based upon prey availability rather than absolute prey abundance. Spruce forests in Idaho supported large numbers of small mammals whereas lodgepole pine stands supported smaller numbers of prey. However, due to low snow cover in lodgepole stands, prey were more vulnerable there (Hayward 1989). Therefore, situations where spruce or subalpine fir stringers extend into stands of lodgepole pine may be important because the stringers provide trees of suitable diameter for cavities and the lodgepole pine forests offer areas where prey are vulnerable due to low snow cover.

Roost sites chosen by boreal owls appear to be associated with the end of their foraging excursions for the night (Hayward 1989). Forest structure surrounding roost sites is likely a function of the habitat in which boreal owls forage. Several patterns emerged from Hayward's (1989) analysis of roost sites chosen throughout the year. Winter roosts characteristically were located in bottomlands and exhibited over 58% canopy cover, basal area of 26 m^2/ha, 1620 trees/ha between 2.5 and 23 cm dbh, and 165 trees/ha that were greater than 23 cm dbh. Roosts used during summer months, on the other hand, typically were located on mid- and upper-slopes and exhibited 63.5% canopy cover, 29.8 m^2 /ha basal area, 2618 trees/ha between 2.5 and 23 cm dbh, and 208 trees/ha larger than 23 cm dbh. Summer roosts, therefore, were surrounded by a significantly higher density of sapling and pole trees than were winter roosts, a structural characteristic that significantly reduces the temperature experienced by the roosting owls at atmospheric temperatures greater than 40°F. Small owls appear to exhibit poor thermoregulatory capabilities in warm temperatures (Ligon 1968), a physiological disadvantage that apparently drives boreal owls to choose dense forest stands for roosting during warm summer months.

Winter home ranges in central Idaho average approximately 1500 ha (3700 acres), whereas, summer ranges average 1200 ha (3000 acres) (Hayward 1989).

Using Maps

Based upon analysis of potential vegetation types, percentages of each type potential vegetation type, and average patch-size of each potential vegetation type, boreal owls may be expected to occur in the following land-type associations (LTA) of the Elkhorn Wildlife Management Unit (LTA followed by the potential vegetation that makes the LTA appropriate for this species): 6 (spruce, subalpine, and Douglas fir), 7 (subalpine and Douglas fir), 8 (subalpine fir, spruce stringers, and whitebark pine), 9 (subalpine fir, spruce, lodgepole pine, and Douglas fir), and 10 (subalpine and Douglas fir).

Big Belt Mountains: Based upon analysis of potential vegetation types, percentages of each type potential vegetation type, and average patch-size of each potential vegetation type, boreal owls may be expected to occur in the following land-type associations (LTA) of the Big Belt Mountains (LTA followed by the potential vegetation or physiographic feature that makes the LTA appropriate for this species): 1 (subalpine fir, Douglas fir, and lodgepole pine), 7 (subalpine fir and Douglas fir), and 12 (subalpine fir and Douglas fir), 13 (subalpine fir and Douglas fir), 14 (subalpine fir, Engelmann spruce, Douglas fir, lodgepole pine, and aspen), 15 (subalpine fir and Douglas fir), 16 (subalpine fir and Douglas fir), 17 (subalpine fir,whitebark pine, and Douglas fir), 18 (subalpine fir and whitebark pine), 19 (subalpine fir and Engelmann spruce), 23 (subalpine fir and Douglas fir), and 24 (subalpine fir, Douglas fir, aspen, Engelmann spruce).

Surveying and Monitoring

Nocturnal calling surveys using a taped song of a male boreal owl provide the most direct method of establishing presence/absence of this species. Surveys should be performed from mid-February to early April. Due to the variability in boreal owl population dynamics, Hayward (1989) noted that a single year of no responses does not mean that the area is unoccupied by owls. Ideally, surveys should be run in consecutive years to determine if each area does support boreal owls.

Each survey should consist of a series of calling stations separated by at least 500 m. Surveys should be initiated approximately 1/2 hour following sunset. At each station the surveyor should begin the observation period with 2-3 minutes spent listening followed by a period of calling not to exceed 1 minute. Periods of listening and calling should be alternated for at least 10 minutes before moving on to the next calling station.

Actual monitoring of boreal owl breeding activity, however, demands efforts that result in the location of nests and subsequently describing the success and productivity of these nests over a period of several years.

Management Strategies

Management for boreal owls on the Helena National Forest should involve the following:

1. Retain areas with large-diameter snags (> 38 cm dbh) as well as providing a source for snag replacement (Hayward 1989). Hayward (1989) noted that stands supporting potential boreal owl nesting sites may be small (< 1 ha) and may be less than 1 km apart.

2. Aspen stands should be maintained, especially those that support large-diameter snags.

3. Roosting habitat can retained through the maintenance of older coniferous forest stands (winter) and mature and old-growth spruce-fir stands (summer).

4. Foraging habitat should be managed to maintain abundant populations of small mammals. In addition to abundant prey numbers, the foraging habitat must remain fairly open to allow for the flight of boreal owls. Therefore, spruce-fir forest stands containing a patchy distribution of trees and moderate canopy closure are the ideal foraging habitat description.

5. The suite of habitat parameters important to boreal owls can best be maintained through the implementation of uneven age forest management over a large area due to the large home range size of this species (Hayward 1989).

Literature Cited

Brelsford, M. 1992a. Boreal owl (Aegolius funereus) and flammulated owl (Otus flammeolus) survey results for the Bozeman District of the Gallatin National Forest. Unpubl. Rep. Gallatin Natl. For. 19 pp.

Brelsford, M. 1992b. Boreal owl (Aegolius funereus) and flammulated owl (Otus flammeolus) survey results for the Livingston District of the Gallatin National Forest. Unpubl. Rep. Gallatin Natl. For., Mont. Nat. Heritage Prog. 22 pp.

Carlson J.C. 1991. Results of boreal owl (Aegolius funereus) surveys on the Jefferson Division of the Lewis and Clark National Forest. Challenge Cost-Share Rep., Lewis and Clark Natl. For., Mont. Nat. Heritage Prog. 30 pp.

Cramp, S. 1985. Handbook of the birds of Europe, the middle East and North Africa, Volume IV. Oxford Univ. Press, London.

Hayward, G.D. 1989. Habitat use and population biology of boreal owls in the northern Rocky Mountains, USA. Ph.D. Diss., Univ. Idaho, Moscow. 88 pp.

Hayward, G.D. and P.H. Hayward 1991. Body measurements of Boreal Owls in Idaho an a discriminant model to determine sex of live specimens. Wilson Bull. 103:497-500.

Hayward, G.D., P.H. Hayward, E.O. Garton, and R. Escano. 1987. Revised breeding distribution of the boreal owl in the northern Rocky Mountains. Condor 89:431-432.

Holt, D.W. and D. Ermatinger. 1989. First confirmed nest site of boreal owls in Montana. Northw. Nat. 70:27-31.

Korpimaki, E. 1981. On the ecology and biology of Tengmalm's Owl (Aegolius funereus) in southern Ostrobothnia and Suomenselka, western Finland. Acta Univ. Ouluensis 118:1-84.

Ligon, J.D. 1968. The biology of the elf owl (Micrathene whitney). Univ. Mich. Mus. Zool. Misc. Publ. 136. 70 pp.

Mikkola, H. 1983. Owls of Europe. Buteo Books, Vermillion, S.D.

Palmer, D.A. and R.A. Ryder. 1984. The first documented breeding of the boreal owl in Colorado. Condor 86:215-217.1986

Rogers, T.H. 1986. Northern Rocky Mountain-Intermountain Region. Amer. Birds 41:120.

Ryder, R.A., D.A. Palmer, and J.J. Rawinski. 1987.Distribution and status of the boreal owl in Colorado. pp. 169-174 in: Nero, R.W., C.R. Knapton, and R.J. Hamre, eds., Biology and conservation of northern forest owls: symposium proceedings. Gen. Tech. Rep. RM-142. Fort Collins, Col.: USDA For. Serv., Rocky Mountain For. Range Exp. Stat. 309 pp.

Black-backed Woodpecker (Picoides arcticus)

Introduction

The black-backed woodpecker breeds in boreal forests across North America, and south in the Cascade Mountains, and northern portions of the Sierra Nevada and Rocky Mountains (American Ornithologists' Union 1983). It breeds throughout western Montana and is non-migratory (Bergeron et al. 1992). Little is known about this species compared to other woodpeckers in North America. The U.S. Forest Service, Region 1, lists the black-backed woodpecker as Sensitive; the Montana Natural Heritage Program lists its state rank as S3.

Habitat

Very low density black-backed woodpecker populations can be expected in mature/old growth forest, most often with a pine component, ie. lodgepole pine, ponderosa pine, mixed conifer. However, managing for this species involves more than simply managing for old growth and mature stands. Black-backed woodpecker distribution is typically spotty, occurring where large populations of larvae wood-boring beetles exist. This is found in what are usually "salvage sale areas" created by fires, blowdown, or heavy insect infestations. Studies indicate that black-backed woodpeckers need access to feeding areas where beetles are concentrated. Typically, fire and blowdown areas have a useful period of about 3 years until beetle populations decline. Adequate foraging habitat may be the limiting factor for black-backed woodpeckers in far more cases than nesting habitat. Home range sizes have been found to vary from 72-328 ha (Goggans et al. 1989). We discuss both nesting and foraging habitat below.

Nesting habitat. In a 480 ha burned area in western Montana (Harris 1982), nests were found in Douglas-fir, ponderosa pine and western larch in trees averaging 23.3 cm dbh. Tree density in the nest area was high (1170 trees /ha). In northeast Oregon (Bull et al. 1986) nests were found in ponderosa pine, lodgepole pine and western larch. Nest trees were typically small diameter (<50 cm dbh), tall (>15 m) and recently dead (<5 years). Stem density was 350 per acre. The study area took place during a large bark beetle infestation. In central Oregon (Goggans et al. 1989) black-backed woodpeckers selected mature and old growth stands and nested only in lodgepole pine trees. Nest trees (live and dead) had heartrot and averaged 28 cm dbh.

Foraging Habitat. Bull et al. (1986) found black-backed woodpeckers usually feed by "scaling" (removing bark flakes by prying), however Harris (1982) found the predominant foraging technique to be "pecking." Black-backed woodpeckers feed primarily on beetles (Baldwin 1960, Bent 1964, Wickman 1965). These are particularly abundant in areas of insect infestations and recent fires and blowdown. In western Montana (Harris 1982)

black-backed woodpeckers selected western larch for foraging and avoided Douglas-fir. Diameter of trees selected typically were 11-15 cm. Recently burned habitat had much higher use than adjacent unburned areas.

Following a mountain pine beetle outbreak in northeast Oregon, black-backs foraged in all forest types on both live and dead trees (Bull et al. 1986); 97% of foraging occurred on ridges. Live lodgepole pine and recently dead trees (<2 years) were most commonly used. Trees averaged 31 cm dbh.

Foraging in central Oregon was concentrated in unlogged mature and old growth stands (Goggans et al. 1989). Beetle infested lodgepole pine trees were used almost exclusively and averaged 38 cm dbh.

Using Maps

The map produced by the FSTSDB only partially delineated general habitat for this species. A field check revealed additional stands were suitable, particularly in adjacent polygons. A better map to use for medium quality potential habitat may the field checked old growth maps if they have been done for the proposed project area. However, the extremely transitory nature of the prime habitat used by black-backed woodpeckers make drawing "suitable habitat" on a map an exercise in futility. Gathering data over a 2 year period, then taking a year to draw a map, make the map obsolete the following year. Areas being considered for salvage sales (burns, insect infestations, blowdowns) are probably the best source of information on where current prime black-backed woodpecker habitat is likely to be located and how much is available. To this information, you should add areas with insect infestations, recent fires and blowdowns (in the last 3 years) in reserved portions of the forest such as RNAs, wilderness, or roadless areas.

Black-backed woodpeckers may be expected to occur in any of the many land-type associations (LTA) of the Elkhorn Wildlife Management Unit and Big Belt Mountains which contain mixed conifers (particularly with a pine component) or pines.

Surveying and Monitoring

Techniques for surveying and monitoring are in the testing stages. Preliminary survey techniques are appended to this report (Anon. 1992; Appendix 3). Survey are preformed by playing a tape recording of black-backed woodpecker drumming. Responsiveness is best from the time of cavity excavation through egg-laying (about 3 weeks) and is best 1-2 hr following sunrise (Goggans et al. 1989). In the Elkhorns and Big Belts this should be between 15 April and 1 June, depending on elevation (4-6 days/170 m elevation gain; Goggans et al. 1989).

A drumming count should be preformed by walking a transect and stopping for 3 minutes every 0.1 mi. At each stop: 1) listen

for calling, drumming, or pecking; 2) if none are heard, play a recording of a drum after 30 seconds; and 3) continue to play a drum at 30 second intervals during the 3 minute period or until a black-backed woodpecker is heard. If a bird responds, discontinue playbacks and move 0.25 mi. Transects should be 0.5 mi apart, ie. within 0.25 mi of all points in the covered area.

Tapes should be played at volumes similar to drumming woodpeckers. If played at extremely loud volume, nearby woodpeckers may not respond. Do not conduct surveys during windy or rainy conditions. Transects should be repeated after 10 days if no woodpeckers were recorded.

Management Strategies

The Washington Department of Wildlife (1991), utilizing current research information, recommended the following:

1) Retain 30 snags > 17" dbh per 100 ha in harvested areas.

2) Establish woodpecker management areas of about 400 ha within existing or proposed reserves. Salvage sales should not take place in these management areas following fires, insect infestations, or blowdowns. Management areas should include high and low elevation forests dominated by pine.

3) Limit chemical insect control and promote biological control.

Another strategy could involve setting aside 10-20% of salvage sales each year, in blocks of at least 80 ha. Salvage sales are typically in heavily beetle killed stands or recent burns, areas which are prime black-backed woodpecker habitat. Annually setting aside an proportion of these areas would provide a relatively constant source of habitat for black-backed woodpeckers.

Literature Cited

American Ornithologists' Union. 1983. Check-list of North American birds, 6th edition. 877 pp.

Anon. 1992. Survey techniques to monitor three-toed and block-backed woodpeckers. Unpubl. Rep. Workshop on Monitoring Cavity-Nesters, Feb 24-25, 1992. Sponsored by the Wildl. Soc., Ore. Chapt. 9 pp.

Baldwin, P.H. 1960. Overwintering of woodpeckers in bark beetle-infested spruce-fir forests of Colorado. Proc. 12th Internat. Ornithol. Cong. 12:71-84.

Bent, A.C. 1964. Life histories of North American woodpeckers. Dover Publ., Inc., New York, N.Y. 334 pp.

Bergeron, D., C. Jones, D.L. Genter and D. Sullivan. 1992. Montana bird distribution, 4th edition. Mont. Nat. Heritage Prog. Spec. Publ. 2. 118 pp.

Bull, E.L., S. R. Peterson and J.W. Thomas. 1986. Resource partitioning among woodpeckers in northeastern Oregon. USDA For. Serv., Pac. Northw. Res. Stat. Res. Note PNW-444. 19 pp.

Goggans, R., R.D. Dixon and L.C. Seminara. 1989. Habitat use by three-toed and black-backed woodpeckers, Deschutes National Forest, Oregon. Ore. Dept. Fish Wildl. Tech. Rep. 87-3-02. 43 pp.

Harris, M.A. 1982. Habitat use among woodpeckers in forest burns. M.S. Thesis, Univ. Mont., Missoula. 62 pp.

Washington Department of Wildlife. 1991. Management recommendations for priority species. Black-backed Woodpecker. 3 pp.

Wickman, B.E. 1965. Black-backed three-toed woodpecker, Picoides arcticus, predation on Monochamus oregonensis. Pan-Pacific Entomol. 41:162-164.

Townsend's Big-Eared Bat (*Plecotus townsendii*)

Introduction

Townsend's or the western big-eared bat is a medium sized bat with distinctly large ears. The pelage color is variable from dark brown to creamy tan; individuals observed in the Helena area are light brown. The most notable characteristics of this species are the long, light-brown ears and the pair of glandular lumps on either side of the nose. During hibernation or torpor, the ears may be rolled back in a "ram's horn" fashion. This exposes the long, narrow tragus. These bats tend to hang pendant from the open and exposed surfaces of caves and tunnels, often visible to cavern explorers.

The total body length is about 4.1 in (105mm), wingspan is just over 10 in (255 mm), and ear length is approximately 1.4 in (35 mm). Adult weights range from 7-13 g (0.25-0.46 oz); females are slightly larger than males. As a comparison with a more familiar species, the following measurements are typical for an adult little brown bat (*Myotis lucifugus*): total length - 3.4 in (87mm), wingspan - 9 in (228mm), ear length - 0.5 in (14mm), weight - 7.8 g (0.27 oz). Additional field characteristics are provided in Genter (1989), Burt and Grossenheider (1976), and van Zyll de Jong (1985); the later publication having extensive morphological data from Canada and includes color illustrations.

Townsend's big-eared bat is found throughout much of western North America, from British Columbia to central Mexico, as far east as western South Dakota and Texas (Kunz and Martin 1982). Isolated populations are found in the south central U.S. (*P. t. ingens*) and southern Appalachia (*P. t. virginianus*). Both of these subspecies are listed as endangered by the U.S. Fish and Wildlife Service (Federal Register 1983). Populations in the Pacific Northwest (*P. t. townsendii*) are currently listed under Category 2 for consideration of potential listing as threatened or endangered (Federal Register 1991). The subspecies *P. t. pallescens* occurs over much of the interior west, including Montana. It is listed as Species of Special Concern (or equivalent) in Montana and all adjacent states (Genter 1989, Moseley and Groves 1990, Genter 1992). The entire species has been proposed for candidate status and will likely be listed as such in the next Notice of Review.

Populations of *Plecotus* have experienced declines over much of their range; this is particularly evident where historic data are available (Perkins 1985, Pierson and Brown 1992). The vulnerability of these populations to disturbance is high due to their roosting habits (Twente 1955, Genter 1986) and loss of habitat, vandalism, and increased visitation by people to maternity roosts and hibernacula (Humphrey and Kunz 1976, Madsen *et al.* 1992). Pearson *et al.* (1952) speculated that previous mining in California may have provided habitat that allowed populations of *Plecotus* to increase in some areas. Any population increases that may have occurred are more than offset

by the collapse and deterioration of adits and the active reclamation programs going on throughout the west (Pierson and Brown 1992, Genter pers. obs.). This is further compounded by loss or disturbance of natural cave habitat.

Plecotus tends to forage well after dark, selectively taking small moths and other nocturnal insects (Whittaker et al. 1977). They have been reported gleaning insects from foliage (Howell 1920) but most observations in the northern Rockies suggests that Plecotus forages in open air along forest edge or over sagebrush flats (Genter and Metzgar 1985, pers. obs.). This species is very maneuverable and has a slow flight speed. They possess a highly evolved echolocation that is characterized as being of low energy, typically 40-50 db lower than M. lucifugus (Grinnell 1963). Such species are referred to as "whispering" bats. The flight and echolocation habits of Plecotus allow them to easily elude mist nets and make them less audible to standard ultrasonic bat detectors. These factors, combined with their sensitivity to human disturbance at roosts, make them a difficult species to study in the field.

Habitat

Plecotus are generally found in low densities, occupying a range of habitat including moist forests (Thomas and West 1991) as well as arid savannah and shrub-steppe (Genter and Metzgar 1985). In western Montana, they are most closely associated with cavernous habitat and rocky outcrops of sedimentary or limestone origin, which are used for roosting habitat. In large diameter old growth forests, the hollowed interior of trees can be used for roosts. Occasionally individuals will be found in buildings.

In spring and summer (May through August in Montana), females will form maternity colonies in warm areas of caves, mines, and occasionally buildings (Pearson et al. 1952, Genter pers. obs.). These colonies are typically comprised of small clusters of 20 - 180 females, each giving birth to one pup in late June after a gestation period of 55-100 days, temperature dependent (Pearson et al. 1952, Genter unpubl. data). Young bats grow rapidly and are near adult size in one month. The pups are able to fly in three weeks and are weaned at 6 weeks.

During this maternity period females will stay close to the colony and forage nearby, typically within several kilometers but may go further for appropriate foraging or drinking areas. Males will roost singly in cooler caves and outcrops, becoming torpid during the day. This species displays a high degree of site fidelity, returning to the same maternity roost and hibernacula year after year (Pearson et al. 1952, Wackenhut 1990).

Maternity roosts will begin to break up in late August and September. The timing is often dependent on arrival of spring, and temperature during the early summer, both of which influence growth and development of the young. Males and females will congregate at cooler caverns, often referred to as swarming sites. Moving to these roosting areas allow the bats to continue

foraging at night while providing the cool temperatures during the day for energy savings of torpor. Copulation occurs during late September and October. Plecotus will enter hibernation during October, depending on elevation and local weather. Optimal conditions for hibernacula include temperatures between 2-7°C and relative humidity greater than 50% during winter (Genter 1986).

Appropriate and secure roosting habitat is the most limiting factor for most bat species in western Montana. For Plecotus, this includes all caverns, rocky outcrops of sedimentary or calcareous origin, and mining tunnels. Threats to this subterranean habitat includes reclamation of old mines, exploration and vandalism, and seismic activity or road building on or near the caverns or outcrops. Old growth forest communities provide significant roosting habitat for bats (Thomas and West 1991, Genter unpubl. data). The extent to which Plecotus uses snags and old growth in western Montana is unknown.

Using Maps

The maps produced by the FSTSDB were not able to present the geologic and non-forested features that were necessary to assess key habitat features for Plecotus. Foraging areas are only generally described and typically associated with seral stage conifer and shrub-steppe communities. These bats do not forage extensively in old growth conifer forests but may use them for roosting (Thomas and West 1991).

Surveying and Monitoring

The most widely used techniques for surveying and monitoring of bats involve ultrasonic sound detectors and mist nets. Other techniques include direct counts at roosts, visual point counts, and collection using a shotgun. Our intent here is to briefly address the options available and make specific recommendations for baseline surveys, monitoring, and comparative studies. For more detailed information on techniques and equipment used for field studies of bats, see Kunz (1988) and Thomas and West (1989). In any case, the use of techniques and equipment should be used only by individuals who have received appropriate training and experience. This is especially true for examination of roosting habitat.

Monitoring at roosts can be successfully used, particularly where known roosts for species are identified. Disturbance to maternity roosts or hibernacula is of great concern. Direct observation at the exit is feasible but is labor intensive.

Collecting with shotguns may be appropriate for gathering limited information on species distribution, sex and reproductive status, and systematic analyses. It is not considered an appropriate means to determine species composition, abundance, or habitat use due to the bias associated with collecting conditions. Bats are typically shot in open areas, close to the

ground were visibility is possible. Likewise collection and capture with mist nets are biased in that not all bats are equally prone to fly into nets. As mentioned above, Townsend's big-eared bat is particularly adept at flying around and over obstructions, including mist nets. Also, some species, such as the silvery haired bat (Lasionycteris noctivagans) and spotted bat (Euderma maculatum) tend to fly high above the ground. Mist nets can be used successfully in identifying species present in selected habitat and developing distributional data.

Perhaps the most significant breakthrough in field study of bats is the development of ultrasonic detectors. Thomas and West (1988) describe the use and application for this technology on echolocating bats. Simply stated, they allow field biologists to develop standardized and repeatable survey and monitoring techniques for bats that have fewer biases than collecting. There are difficulties in distinguishing certain species' calls from other similar calls. This is usually dealt with by grouping certain species together for data analysis (Thomas and West 1991).

Efforts to establish baseline data on species presence, relative abundance, reproductive status, and habitat use should employ a combination of methods including mist netting, ultrasonic detectors, harp traps, and spelunking. Voucher specimens for range extensions and Myotis species should be collected. Sampling protocol for bats is currently being developed for Montana and should be available through the Montana Natural Heritage Program by mid-1993.

Management Strategies

1) Caves and abandoned mines used as maternity roosts or hibernacula should be protected and managed as critical habitat. Seasonal restrictions should be placed on entry between May and mid-September for maternity roosts and October through April for hibernacula.

2) Caves or abandoned mines with known bat use should be evaluated for gate installation. Likewise, roads that access such caverns should be closed, where feasible.

3) Areas immediately surrounding caverns, rockfaces, or other known roosts should retain their canopy overstory. Heavy equipment and blasting should not be permitted near such sites.

4) Survey existing cave and mine habitat on public lands. Maintain those structures with known bat use, placing gated entry where necessary.

5) Retain large diameter snags and stands of old growth forest for maintenance of roosting habitat.

6) Limit chemical insect control.

Literature Cited

Burt, W.H. and R.P. Grossenheider. 1976. A field guide to the mammals. 3rd ed. H. Mifflin Co. Boston, Mass. 289 pp.

Federal Register. 1983. Endangered and threatened wildlife and plants. 48 FR 34182, July 27, 1983.

Federal Register. 1991. Endangered and threatened wildlife and plants; animal candidate review for listing as endangered or threatened species. FR 56(225): 58804-58836.

Genter, D.L. 1986. Wintering bats of the upper Snake River Plain: occurrence in lava-tube caves. Great Basin Nat. 46:241-244

Genter, D.L. 1989. Townsend's big-eared bat, Plecotus townsendii. pp. 103-104 in Rare, sensitive, and threatened species of the Greater Yellowstone Ecosystem. T.W. Clark, A.H. Harvey, R.D. Dorn, D.L. Genter, and C. Groves. eds. NRCC, MTNHP, TNC, MWES 153 pp.

Genter, D.L. 1992. Animal species of special concern in Montana. Mont. Nat. Heritage Prog. Helena. 10 pp.

Genter, D.L. and L.H. Metzgar. 1985. Survey of the bat species and their habitat use in Grand Teton National Park. Pp. 65-69 in Univ. Wyo.-Natl. Park Serv. Res. Center, 9th Annual Rep.

Grinnell, A.D. 1963. The neurophysiology of audition in bats: intensity and frequency parameters. J. Physiol., 167: 38-66.

Howell, A.B. 1920. Some Californian experiences with bat roosts. J. Mammal. 1:169-177.

Humphrey, S.R. and T.H. Kunz. 1976. Ecology of a Pleistocene relict, the western big-eared bat (Plecotus townsendii), in the southern Great Plains. J. Mammal. 57:470-494.

Kunz, T.H. ed. 1988. Ecological and behavioral methods for the study of bats. Smithsonian Inst. Press. Washington, D.C. XXX pp.

Kunz, T.H. and R.A. Martin. 1982. Plecotus townsendii. Mammalian Species 175:1-6.

Madsen, M., G. Hanson, D. Genter, and S. Martinez. 1992. Winter surveys of caves in the Pryor Mountains of southcentral Montana. Rep. to USDI Bur. Land Manage., Mont. Nat Heritage Prog., Helena. XXX pp.

Moseley, R. and C. Groves. 1990. Rare, threatened and endangered

plants and animals of Idaho. Idaho Dept. Fish Game. Boise. 33 pp.

Pearson, O.P., M.R. Koford, and A.K. Pearson. 1952. Reproduction of the lump-nosed bat (Corynorhinus rafinesquii) in California. J. Mammal. 33:273-320.

Pierson, E.D. and P.E. Brown. 1992. Saving old mines for bats. Bats 10:11-13.

Perkins, M. The plight of Plecotus. Bats 2:1-3.

Thomas, D.W. and S.D. West. 1989. Sampling methods for bats. Gen. Tech. Rep. PNW-243 USDA For. Serv., Portland, Ore. 20 pp.

Thomas, D.W. and S.D. West. 1991. Forest age associations of bats in the southern Washington Cascade and Oregon Coast Ranges. in Wildlife and Vegetation of unmanaged Douglas-fir forests. USDA For. Serv. Gen. Tech. Rep. PNW-GTR-285. Portland, Ore. 533 pp.

Twente, J.W.,Jr. 1955. Some aspects of habitat selection and other behavior of cavern-dwelling bats. Ecol. 36:706-732.

van Zyll de Jong, C.G. 1985. Handbook of Canadian mammals. II. Bats. Natl. Mus. Nat. Sci. Ottawa. 212 pp.

Wackenhut, M.C. 1990. Bat species overwintering in lava-tube caves in Lincoln, Gooding, Blaine, Bingham, and Butte counties, Idaho with special reference to annual return of banded Plecotus townsendii. MS thesis, Idaho State Univ., Pocatello. 64 pp.

Whittaker, J.O., Jr., C. Maser, and L.E. Keller. 1977. Food habits of bats of western Oregon. Northw. Sci. 51:46-55.

Northern Bog Lemming (Synaptomys borealis)

Introduction

The northern bog lemming is a little known vole with a few relict populations in the lower 48 states; the subspecies chapmani occurs in Montana, Idaho, and northeast Washington (Hall 1981). Bog lemmings are known from 4 locations in Idaho and 8 in Washington, all from within 50 miles of the Canadian border (Johnson and Cheney 1953, Wilson et al. 1980, Reichel 1984, Groves and Yensen 1989, Don Johnson pers. comm.). Bog lemmings are now know from 9 locations across a wide area in western Montana. Populations are located across the northern edge of the state from the Idaho border to Glacier National Park; in Shoofly Meadows in Lolo National Forest; and south to Maybee Meadows, Beaverhead Co. (Wright 1950, Weckwerth and Hawley 1962, Adelman 1979, Reichel 1993). The Maybee Meadows site is the southern-most known population of the species outside of New England and the first population known from east of the Continental Divide in Montana. Elevations of the Montana sites where bog lemmings have been captured range from 3800-6520 feet. In 1991, the Lolo was the only national forest bog lemmings were known from; during 1992 they were found in the Kootenai, Flathead, Bitterroot, and Beaverhead National Forests (Reichel 1993). Given the recently found populations in various parts of Montana, it seems feasible that the northern bog lemming could occur on the Helena National Forest. The U.S. Forest Service, Region 1, lists the northern bog lemming as Sensitive; the Montana Natural Heritage Program lists it as a Species of Special Concern (S2).

Habitat

During 1992, northern bog lemmings were caught either in, or very close to, thick mats of sphagnum moss (Sphagnum sp.). Sphagnum moss seemed to be the most reliable indicator of a potential site. Some sites where bog lemmings were caught had an open overstory of subalpine fir (Abies lasiocarpa) and/or spruce (Picea); others were without a tree component. Bog birch (Betula glandulosa) and\or a dwarf willow (Salix sp.) were present at all sites. Bog lemmings at the Sunday Creek site were caught in two community types: 1) a Salix drummondiana community with only 10% S.d. canopy cover; and 2) a Abies lasiocarpa community, Calamagrostis canadensis phase, with canopy cover of 40% A.l. (overstory) and 60% Betula glandulosa (shrub layer). Moss ground cover was 50-60% and 30-50 cm thick.

Previous habitat descriptions of S.b. chapmani trapping sites in the northern Rocky Mountains have sometimes included mention of sphagnum moss (Layser and Burke 1973, Groves and Yensen 1989, D. Johnson pers. comm.) while others have not (Wright 1950, Weckwerth and Hawley 1962, Wilson et al. 1980). Reichel spent several hours along Camas Creek in the vicinity of the first lemming population known from the state (Wright 1950)

and found only scattered clumps of moss. Weckwerth and Hawley (1962) did not describe the specific sites where they captured bog lemmings. Reichel captured a single juvenile male lemming on a dry alpine/subalpine ridge in northeast Washington (Wilson et al. 1980) and believes it was a dispersing individual.

We believe that areas with extensive sphagnum mats are the most likely sites in which to find new bog lemming populations in Montana. Other habitats may support lower densities of bog lemmings; may be used primarily by dispersing individuals; may be used during specific seasonal, climatic, or competitive situations; or may be population sinks. The only certainty is that there is much to be learned about habitat use by northern bog lemmings.

Using Maps

The map produced by the FSTSDB was unusable for this species. Timber types are not fine-grained enough to be useable for this extreme habitat specialist. Project areas within 100 m of riparian or wetland habitats should be examined for mats of sphagnum moss. If mats of sphagnum moss are found, it should be assumed lemmings are present for management purposes.

Surveying and Monitoring

Surveying for bog lemmings has primarily involved trapping. During 1992 we found bog lemmings at 5 of 21 sites examined in western Montana. Success rates (captures of bog lemmings per 100 trap nights) at locations with bog lemmings present varied from 1.67 in Museum Special snap traps, 1.33 in pitfalls, down to 0.09 in Sherman live traps. A mixture of Dailey's muskrat lure mixed with peanut butter and oatmeal appeared more effective at capturing northern bog lemmings than other baits used, but differences were not significant ($G = 3.44$, 3 df). Dropping boards may be effective for some preliminary survey work, but it is unknown whether such boards are avoided or not by lemmings. Additionally, at least some lemming droppings are brown and may not be distinguishable from other vole droppings.

Population monitoring has not been done with northern bog lemmings. Detailed population, habitat use and movement data is most commonly obtained using mark-recapture techniques with live traps. However, for northern bog lemmings, Sherman live-trap use: 1) is labor intensive throughout the trapping period; 2) has very low success with any bait tried; and 3) results in at least some mortality (the single animal caught died in the trap). Pitfall trap use: 1) is labor intensive especially during placement; 2) cannot be used in the saturated soil situations commonly encountered in bog lemming habitat; and 3) results in at least some mortality during and between trapping periods. Incidental mortalities may be a significant factor over a study long-term enough to yield good information. Given these results, it seems doubtful that live-trapping methods, by themselves, will

yield much information on habitat use, population parameters, or home range sizes.

Dropping boards may provide one monitoring option, but we think differentiating northern bog lemming dropping from other voles will be difficult. Jones and Birney (1988) report that northern bog lemming droppings are bright green while other vole droppings are brown or black. However, we found that at least some bog lemmings had brown droppings. If color alone is used to differentiate the droppings, it may lead to serious biases.

Management Strategies

Based on limited observations at the sites where bog lemmings were found we would make several interim management recommendations. We feel these are the minimum necessary to maintain viable bog lemming populations. Additional research is needed and may show other management actions will be necessary for bog lemming population maintenance.

1) Assume northern bog lemmings are present on all National Forests in Montana during land management planning processes, with the exception of the Custer National Forest.

2) Maintain a 100 m buffer around riparian areas/corridors where sphagnum mats are found.

3) Minimize domestic livestock grazing in drainages with sphagnum mats present. Range conditions in riparian areas with sphagnum mats should be maintained in good to excellent categories. If current range condition is fair or poor, stocking rates should be reduced to a point where rapid recovery occurs.

4) Avoid anthropogenic activities which will affect stream-flow in drainages with sphagnum mats present in them.

Very little information is available on the northern bog lemming. Even the distribution in the U.S. is poorly understood; most populations have been found with the past 15 years. We recommend the following as the highest priority needs on the Helena National Forest, in relation to northern bog lemmings. Surveys should be conducted to determine if northern bog lemmings are present on the Forest and to better understand their distribution in Montana. All individuals collected should be preserved as scientific specimens and stomachs should be preserved for food habitats analysis. Plant community surveys should be conducted at all bog lemming locations found; this should include identification of dominant mosses present.

Literature Cited

Adelman, E.V. 1979. A survey of the nongame mammals in the Upper

Rattlesnake Creek drainage of Western Montana. M.S. Thesis, Univ. Mont., Missoula. 129 pp.

Groves, C. and E. Yensen. 1989. Rediscovery of the northern bog lemming (Synaptomys borealis) in Idaho. Northw. Nat. 70:14-15.

Hall, E.R. 1981. The mammals of North America, 2nd edition, 2 vols., John Wiley and Sons, N.Y.

Johnson, M.L. and P.W. Cheney. 1953. Synaptomys in Idaho and northeastern Washington. Murrelet 34:10.

Jones, J.K., Jr., and E.C. Birney. 1988. Handbook of mammals of the north-central states. Univ. Minn. Press, Minneapolis.

Layser, E.F. and T.E. Burke. 1973. The northern bog lemming and its unique habitat in northeastern Washington. Murrelet 54:7-8.

Reichel, J.D. 1984. Ecology of Pacific Northwest alpine mammals. Ph.D. thesis, Wash. St. Univ., Pullman. 91 pp.

Reichel, J.D. 1993. Northern bog lemming survey, 1992 (DRAFT). Mont. Nat. Heritage Prog. Rep. to Kootenai Nat. For. 29 pp.

Weckwerth, R.P. and V.D. Hawley. 1962. Marten food habits and population fluctuations in Montana. J. Wildl. Manage. 26:55-74.

Wilson, C., R.E. Johnson and J.D. Reichel. 1980. New records for the northern bog lemming in Washington. Murrelet 61:104-106.

Wright, P.L. 1950. Synaptomys borealis from Glacier National Park, Montana. J. Mammal. 31:460.

Wolverine (Gulo gulo)

Introduction

The wolverine is circumboreal in distribution, occurring in tundra and boreal/montane forests across North America, and south in the Cascade, Sierra Nevada, and Rocky Mountains (Hall 1981, Hash 1987). It occupies mountainous habitat over much of western Montana (Thompson 1982). While the wolverine is known from the main Rocky Mountains to the west, it has not been reported from the Elkhorns or Big Belts (however, see discussion of movements and dispersal below). The U.S. Forest Service, Region 1, lists the wolverine as Sensitive; the U.S. Fish and Wildlife Service lists the wolverine as a Category 2 species (C2 = Taxa for which information now in possession indicates that proposal to list as threatened/ endangered is possibly appropriate); the Montana Natural Heritage Program lists it as a Species of Special Concern (G4S4); and the wolverine is a furbearer with restricted harvest under statutes of the Montana Department of Fish, Wildlife and Parks.

Habitat and Life History

Wolverines occur in a wide variety of habitats throughout their range (Hornocker and Hash 1981, Gardner 1985, Magoun 1985, Hash 1987, Butts 1992a). Most often they are associated with tundra or boreal/montane forests. In Montana, Hornocker and Hash (1981) found most wolverine use in medium to scattered mature timber, while areas of dense young timber were used least. Wolverines avoided clearcuts and burns, crossing them rapidly and directly when they were entered at all. Higher elevation areas were used in the summer, lower elevations in the winter.

Hash (1987) reported that wolverines in the northern Rocky Mountain region were associated with firs, pine, and larch. Aspen stands were also used, as were cottonwoods in riparian areas. Ecotonal areas appeared to be important habitat components.

Hatler (1989) believed that wolverines are not dependant on any particular vegetative habitat type. Banci (1986) reported "habitat requirements appear to be large, isolated tracts of wilderness supporting a diverse prey base, rather than specific plant associations or topography." South of the boreal forest, most habitat descriptions in the literature agree with Grove's (1988) characterization of "large, mountainous, and essentially roadless areas."

Home range sizes of wolverines in North America vary widely, but are always large. Reported male home ranges varied from 238 km^2 in the Yukon (Banci 1987) to 666 km^2 in Alaska (Magoun 1985); in Montana the mean for 9 males was 422 km^2 (Hornocker and Hash 1981). Female home ranges are smaller, particularly when nursing young.

Wolverines are typically solitary animals, with males usually

associating with females only during the breeding season. Some researchers believe wolverines maintain single sex territories, with male territories overlapping female territories (Gardner 1985, Magoun 1985, Banci 1987). However, Hornocker and Hash (1981) found substantial overlap between territories of both the same and opposite sexed animals.

Densities of wolverines have been measured at from 1 resident per 48 km^2 in foothills along coastal Alaska (Magoun 1985) to 1 resident per 177 km^2 in the Yukon (Banci and Harestad 1990). In Montana, Hornocker and Hash (1981) found 1 resident per 65 km^2. Wolverine abundance (and occurrence) is probably dependant on a diverse and plentiful food supply (Van Zyll de Jong 1975, Hornocker and Hash 1981, Hash 1987).

Wolverines are known as wanderers, often traveling large distances in a short time. Magoun (1985) reported average daily distances between telemetry relocation points were 12.3 km for males and 4.2 km for females. One male traveled at least 35.6 km in a 24 hr period. Hornocker and Hash (1981) relocated animals every 3 days; maximum distances between relocations were 64 km for males and 38 km for females. Dispersal movements are known to be considerable farther, with distances of 300 km and more reported (Magoun 1985, Gardner et al. 1986).

Carrion is a significant food source for wolverines throughout their range (Hornocker and Hash 1981, Gardner 1985, Banci 1987, Magoun 1987). The wolverine is a generalist and will eat nearly anything it can find or catch; all foods mentioned in the literature are listed by Hatler (1989). It will cache excess food it finds or catches for use at a later time. The wolverine's habit of caching food and eating carrion makes it particularly susceptible to trapping and poisoning (Hash 1987). This would hold true for either sets meant specifically for wolverines or incidental to trapping/poisoning for other species.

Using Maps

The map produced by the FSTSDB only partially delineated general habitat for this species. However, as discussed above, vegetative type maps may not be suitable predictors of wolverine presence. A better map to use for potential habitat may be to delineate all alpine and forested habitat in roadless areas larger than an average male wolverine territory (422 km^2).

Surveying and Monitoring

Various techniques for surveying and/or monitoring wolverines have be used including: literature reviews; questionnaires; rare mammal "Wanted Posters;" bait/scent stations with hair traps, cameras, or tracks; radiotelemetry; live traps; aerial surveys; and winter track surveys (McKay 1991).

The Monitoring Committee of the Interagency Lynx-Wolverine-Fisher Working Group is developing: 1) a key to allow the biologist to select the appropriate method based on management

objectives and cost; and 2) a manual of standard survey and monitoring techniques and their recommendations (Butts 1992a). The Monitoring Committee believes the monitoring device/program be: 1) affordable; 2) verifiable; 3) easy to transport and establish; 4) standardized; and 5) simple to use. They identified different levels of monitoring: I) presence or absence; II) distribution; III) population trend; IV) population size; and V) population composition. The Committee developed a list of techniques which could be used for Level I monitoring and discussed advantages, disadvantages and costs (Table 1).

Management Strategies

Managing for viable populations of wolverines cannot be done on a District level due to the low density of animals. It must be done on Forest, multi-Forest, or even Regional basis (Hornocker and Hash 1981). Hornocker and Hash (1981) believed their 1300 km^2 study area was only a local unit of a regional population. Population viability lasting beyond a century in mid-large sized mammals requires an effective biological population size in the high 100s (Schonewald-Cox 1983, Marcot et al. in press). With densities of wolverines in good habitat in Montana at 1 resident per 65 km^2 (Hornocker and Hash 1981) that would indicate a planning unit should be at least 50,000 km^2.

Historically, wolverines inhabiting the Elkhorn and Big Belt Mountains were simply a part of a larger northern Rocky Mountain population. Movements between the main range, Elkhorns, and Big Belts were nearly unimpeded by unsuitable habitat. However, even both mountain ranges combined probably held only about 30 wolverines, certainly not a long-term viable population by itself.

Today, several factors limit the Elkhorn and Little Belt mountains as suitable wolverine habitat. First, ungulate populations are reduced in both biomass and diversity. Second, suitable forested roadless areas are substantially reduced; the largest roadless areas are smaller than an average male wolverine home range. Third, wolverine movements between the main Rocky Mountains and the Elkhorns and Big Belts are more difficult due to development in intervening areas.

Lack of knowledge of population parameters, movements (particularly dispersal), and mortality (especially man-caused) limits the specificity and defensibility of management recommendations. Our recommendations should be considered interim and be revised as additional information becomes available. We recommend the following as strategies for managing wolverines:

1) Develop a management plan on a Forest or Multi-Forest basis. Preferably this would be done in conjunction with BLM and Montana Department of Fish, Wildlife and Parks.

2) Survey/monitor wolverines in and adjacent to possible

wolverine management areas. The level of surveying/monitoring would be determine by the management objectives.

If the Elkhorns and Big Belts are to be included as wolverine management areas, then the following would be appropriate:

3) Maintain or expand current roadless areas in both ranges.

4) Reduce road densities (<1 mile per square mile) in areas adjacent to core roadless areas.

5) Restrict motorized vehicle (auto, snowmobile, ATV) use of management areas, especially during late winter/early spring.

6) Minimize size and number of clearcuts.

7) Maintain and encourage ungulate populations, particularly wintering areas in remote locations, inaccessible to trapping or concentrated human use.

8) In areas where wolverine expansion is desired, prohibit scent and bait trapping with traps large enough to catch/kill wolverines.

Literature Cited

Banci, V. 1986. The wolverine in the Yukon: myths and management. Discovery 15:134-137.

Banci, V. 1987. Ecology and behavior of wolverine in Yukon. Unpubl. M.S. Thesis, Univ. B.C., Vancouver. 178 pp.

Banci, V. and A. Harestad. 1990. Home range and habitat use of wolverine Gulo gulo in Yukon, Canada. Holarctic Ecol. 13:195-200.

Butts, T.W. 1992a. Wolverine (Gulo gulo) biology and management: a literature review and annotated bibliography. U.S. For. Serv., Region 1: Threatened, Endangered, and Sensitive Species Prog. 105 pp.

Gardner, C.L. 1985. The ecology of wolverines in southcentral Alaska. M.S. Thesis. Univ. Alaska, Fairbanks. 82 pp.

Gardner, C.L., W.B. Ballard and R.H. Jessup. 1986. Long distance movement by and adult wolverine. J. Mammal. 67:603.

Groves, C. 1988. Distribution of the wolverine in Idaho as determined by mail questionnaire. Northw. Sci. 62:181-185.

Hall, E.R. 1981. The mammals of North America, 2nd ed. 2 vols.

John Wiley and Sons, New York, N.Y.

Hash, H.S. 1987. Wolverine. Pp. 574-585 in: M. Novak, J. Baker, M. Obbard, and B. Malloch (eds), Wild furbearer management and conservation in North America. Ministry Nat. Res. Ontario.

Hatler, D.F. 1989. A wolverine management strategy for British Columbia. B.C. Ministry Environ., Victoria, Wildl. Bull. B-60.

Hornocker, M.G. and H.S. Hash. 1981. Ecology of the wolverine in northwestern Montana. Can. J. Zool. 59:1286-1301.

Magoun, A.J. 1985. Population characteristics, ecology, and management of wolverines in northwestern Alaska. M.S. Thesis, Univ. Alaska, Fairbanks.

Magoun, A.J. 1987. Summer and winter diets of wolverines Gulo gulo in arctic Alaska. Can. Field-Nat. 101:392-397.

Marcot, B.G., R. Holthausen and H. Salwasser. in press. Viable population planning. Conference on Managing Viable Populations. Ann Arbor, Mich. 1984.

McKay, R. 1991. Biological assessment and inventory plan for the wolverine (Gulo gulo) in the Uinta Mountains. Utah Nat. Heritage Prog. and Utah Dept. Nat. Res., Salt Lake City. 58 pp.

Schonewald-Cox, C.M. 1983. Conclusions: guidelines to management: a beginning attempt. Pp. 414-445. in: Schonewald-Cox, C.M., S.M. Chambers, B. MacBryde, and L. Thomas (eds). Genetics and conservation: a reference for managing wild animal and plant populations. Benjamin/Cummings, London.

Thompson, L.S. 1982. Distribution of Montana amphibians, reptiles and mammals. Mont. Audubon Council, Helena. 24 pp.

Van Zyll de Jong, C.G. 1975. The distribution and abundance of the wolverine (Gulo gulo) in Canada. Can. Field-Nat. 89:431-437.

Table 1. Surveying and monitoring strategies for wolverine. (from Butts 1992, p. 37)

IV. Level 1 - Wolverine.

Listed below are the techniques considered, in order of increasing dependence on sophisticated technology, for wolverines at Level 1.

Technique	Advantages	Disadvantages	Costs
1. *Incidental sightings* of individuals and their sign.	Low cost; Many observers; Large area covered, Good PR; Educational; Used at any season; Can ID areas for future work.	Sightings need verification; No control over effort; Limited to visitor use areas; Presence only-limited confidence in absence.	Posters; Brochures; Data entry; Training; Verification.
2. *Surveys*:			
a. *Snow track counts* (trained personnel who return with physical evidence, photo, measurements)	Reliable data on multiple species; Large area covered; Simple-few instruments/hardware; Flexibility of scheduling. Good data on absence.	Need adequate and proper snow cover; Labor intensive.	Transportation; Survival gear; personnel training; Additional gear- cameras tape, film, etc. Costs depend on mode of travel - foot, snowmobile, aircraft
b. *Track-plate counts* (sooted and partially covered with contact paper; baited and enclosed in a "cubby")	Positive ID; Good pad print provides physical evidence from which accurate measurements can be collected; Bait and lure increases detections; Can be used all seasons and when access is best; Easy to schedule; Data on a number of species; Immediate ID not necessary.	No gait pattern; Limited to certain species; Bait/lure can alter behavior; repeat visits by personnel are necessary; More gear needed to transport and set-up; Non-target species can inactivate the station.	More than snow-tracks..(?)
c. *Hair snares* (baited cylinders of wire)	Provides physical evidence; Used during all seasons and by many species; Bait/lure increases detections; Technicians need not be too skilled; Immediate ID not necessary; Potential for genetic ID to species.	ID based on structural characteristics is difficult; Hair is infrequently snared, Bulky; Negative PR.	Similar to track-plate....
d. *Cameras*			
1. *"Low-tech"*; (110 print film; manual trigger)	Inexpensive; Can be used for other studies; Physical evidence and positive ID; Bait/lure increases detection; Used all seasons; Used when access is best; Ease of scheduling; May recognize individuals.	Vulnerable to weather; Relatively high failure rate; Small negative; Trigger requires that subject must pull bait; Non-target species inactivate the station; Limited to 1 photo per visit; Repeat visits necessary to service; Experience technicians necessary; No time/date on film.	Similar to track-plate...

Lynx (*Felis lynx*)

Introduction

The lynx, a medium-sized, short-tailed cat, is circumboreal in distribution, breeding in tundra and boreal/montane forests across North America, and south in the Cascade and Rocky Mountains (Hall 1981, Tumlison 1987). It occurs sporadically in the mountains of western Montana (Thompson 1982). While the lynx is known from the main Rocky Mountains to the west, it has not been reported from the Elkhorns or Big Belts (however, see discussion of movements and dispersal below). Many past and some current publications refer to the North American lynx as *Lynx canadensis*. Lynx literature has recently been summarized by Butts (1992b). The U.S. Forest Service, Region 1, lists the lynx as Sensitive; the U.S. Fish and Wildlife Service lists the lynx as a Category 2 species; and the Montana Natural Heritage Program and the Montana Department of Fish, Wildlife and Parks list it as a Species of Special Concern. The lynx is a furbearer with restricted harvest under statutes of the Montana Department of Fish, Wildlife and Parks.

Habitat and Life History

The lynx is a food specialist, with the snowshoe hare (*Lepus americanus*) being the primary prey throughout North America. The proportion of snowshoe hare in the diet varies with snowshoe density (Brand *et al*. 1976); high lynx populations require snowshoe hare as prey (Brand and Keith 1979). Snowshoe hare populations cycle on an approximate 10 year period. The dominant part the snowshoe hare plays in the lynx diet, and the hare's 10-year cycle, have profound effects on lynx populations and habitat requirements.

Habitat requirements of lynx are tied to the mosaic of habitat types needed for 1) denning sites; 2) cover; and 3) prey species, primarily snowshoe hare. Denning sites are found in mature and old growth lodgepole pine, spruce, and subalpine fir forests with a high density of logs (Koehler 1990a, Koehler and Brittell 1990). Stands for denning sites need not be large (1-3 ha) but several stands should be dispersed in an area and connected by cover habitat to allow females to safely move kittens between dens (Koehler and Brittell 1990).

Lynx require cover for security and stalking prey. Lynx usually do not cross openings wider than 100 m (Koehler and Brittell 1990). Thinnings with 445 trees per ha are used (Koehler 1990a).

Snowshoe hare habitat is dependant on winter browse being available. Willows and birch are typical winter browse species (Klein 1977, Wolff 1980, Litvaitis *et al*. 1985). However, in parts of the West, conifers, especially lodgepole pine are more important (Koehler 1990a). This is likely to be the case in Montana. Browse must be taller than the snow depth by 70-130 cm,

with diameters less than 7 cm (Wolff 1980, Wolfe et al. 1982, Koehler 1990a). In addition to browse, hares require cover for security and thermal protection. Stands with 11,580-33,200 stems per ha fulfill these needs (Brocke 1975, Wolff 1980, Litvaitis et al. 1985, Monthey 1986, Koehler 1990a). Hares often take 6-7 years to begin using clearcuts and 20-25 years to reach maximum densities (Litvaitis et al. 1985). As stands pass 20-30 years old, snowshoe hare cover and forage decline (Brocke 1975, Koehler 1990a). Snowshoe hare home ranges average 8-10 ha (Adams 1959, Dolbeer and Clark 1975, Wolff 1980), and timber management units should be at least that large.

In Montana, Koehler et al. (1979) reported most lynx using fire-created, dense stands of lodgepole pine. Snowshoe hares were abundant in these stands.

Reported home range sizes of lynx in North America vary widely, but are large. Reported home ranges varied from 10 to 243 km^2 (McCord and Cardoza 1982); typical home ranges are 16 to 20 km^2 (Quinn and Parker 1987, Butts 1992b). Home range sizes vary with sex, age, population density, prey density and method of survey and calculation (McCord and Cardoza 1982, Ward and Krebs 1985, Quinn and Parker 1987, Hatler 1988)

Lynx are typically solitary animals, with males usually associating with females only during the breeding season. Some researchers have reported lynx maintain single sex territories (especially males), with male territories overlapping female territories (Mech 1980, Stephenson 1986, Koehler 1987). However, others found substantial overlap between territories of both the same and opposite sexed animals (Nellis et al. 1972, Brand et al. 1976, Carbyn and Patriquin 1983, Ward and Krebs 1985).

Densities of lynx have been measured at from 1 resident per 5 km^2 on Cape Breton Island, Nova Scotia (Parker et al. 1983) down to 1 resident per 77 km^2 in some areas of Alaska (Quinn and Parker 1987). Typically population density estimates are 1 lynx per 15-25 km^2 (Quinn and Parker 1987). Lynx populations generally follow snowshoe hare 10-year cycles, with a lag time of 1-2 years (McCord and Cardoza 1982). However, snowshoe hare (and thus lynx) populations may not be cyclic in the lower 48 states due the fragmented nature of their habitat (Dolbeer and Clark 1975, Koehler 1990b).

Lynx often travel large distances in a short time. Reports of average daily movements have ranged from 1-1.8 km/day (Nellis and Keith 1968) up to 19.2 km/day (Haglund 1966). Dispersal movements are known to be considerable farther, with distances of from 103 to 616 km reported (Saunders 1963, Nellis and Wetmore 1969, Brainerd 1985, Ward 1985, Brittell et al. 1989). Lynx have made movements of 90-125 mi between Montana and Canada (Hash 1990).

Lynx are easily trapped (Burris 1971, Quinn and Parker 1987). Human-caused mortality is not likely to affect lynx populations during the cyclic highs in Canada. However, trapping is likely to be additive to natural mortality at the low point, particularly in marginal habitat such as Montana (Hash 1990).

This is the result of lynx having very low recruitment of young during the low of the hare population cycle (Hatler 1989).

Using Maps

The map produced by the FSTSDB delineated very little habitat for this species. This was surprising since early successional stage lodgepole pine habitat was included in the search parameters. We expect that with increased coverage of the FSTSDB the ability of the system to predict the snowshoe hare habitat component of lynx habitat requirements will be able to be tracked with relative accuracy. However, lynx denning habitat will be difficult to track due to the relative small size of these patches.

Based upon analysis of potential vegetation types, percentages of each type potential vegetation type, and average patch-size of each potential vegetation type, lynx may be expected to occur in the following land-type associations (LTA) of the Elkhorn Wildlife Management Unit (LTA followed by the potential vegetation that makes the LTA appropriate for this species): 3 (lodgepole pine and subalpine fir), 6 (spruce, subalpine fir), 7 (lodgepole pine and subalpine fir), 8 (subalpine fir), 9 (subalpine fir, spruce, and lodgepole pine), and 10 (subalpine fir).

Big Belt Mountains: Based upon analysis of potential vegetation types, percentages of each type potential vegetation type, and average patch-size of each potential vegetation type, lynx may be expected to occur in the following land-type associations (LTA) of the Big Belt Mountains (LTA followed by the potential vegetation or physiographic feature that makes the LTA appropriate for this species): 7 (lodgepole pine and subalpine fir), and 12 (lodgepole pine and subalpine fir), 13 (lodgepole pine and subalpine fir), 14 (subalpine fir, Engelmann spruce, lodgepole pine, and aspen), 15 (subalpine fir and lodgepole pine), 16 (subalpine fir), 17 (subalpine fir and whitebark pine), 18 (subalpine fir and whitebark pine), 19 (subalpine fir and Engelmann spruce), 22 (lodgepole pine), 23 (subalpine fir and lodgepole pine), and 24 (subalpine fir, lodgepole pine and aspen).

Surveying and Monitoring

Snow tracking and radio-telemetry have been used to survey and monitor lynx (Koehler and Brittell 1990, Butts 1992b). Snow tracking may be cost-effective for lynx monitoring but can be affected by the observer's experience, snow and lighting conditions, speed of surveyor, and human activity patterns (Koehler and Brittell 1990).

The Monitoring Committee of the Interagency Lynx-Wolverine-Fisher Working Group is developing: 1) a key to allow the biologist to select the appropriate method based on management objectives and cost; and 2) a manual of standard survey and

monitoring techniques and their recommendations (Butts 1992b). The Monitoring Committee believes the monitoring device/program should be: 1) affordable; 2) verifiable; 3) easy to transport and establish; 4) standardized; and 5) simple to use. They identified different levels of monitoring: I) presence or absence; II) distribution; III) population trend; IV) population size; and V) population composition. The Committee is developing a list of techniques which could be used for Level I-IV monitoring which will discuss advantages, disadvantages and costs of each technique.

Management Strategies

Managing for viable populations of lynx should not be done on a District level due to the low density of animals. It should be done on Forest or multi-Forest basis. Population viability lasting beyond a century in mid-large sized mammals requires an effective biological population size in the high 100s (Schonewald-Cox 1983, Marcot et al. in press). With densities of lynx typically at 1 resident per 20 km^2 in suitable habitat (Quinn and Parker 1987), a planning unit should include at least 15,000 km^2 of suitable habitat.

Historically, lynx inhabiting the Elkhorn and Big Belt Mountains were simply a part of a larger northern Rocky Mountain population. Movements between the main range, Elkhorns, and Big Belts were relatively unimpeded. However, even both mountain ranges combined probably held less than 100 lynx, certainly not a long-term viable population by itself.

Today, several factors may limit the Elkhorn and Little Belt mountains as suitable lynx habitat. First, human-caused mortality may be relatively high due to high road density and easy access to a vast majority of the forest, especially by snowmobile. Second, fire suppression may result in less early successional stage vegetation in lodgepole pine areas; this may have been offset by harvesting and/or increasingly dense forests in traditionally open ponderosa pine areas. Third, lynx movements between the main Rocky Mountains and the Elkhorns and Big Belts are more difficult due to development in intervening areas. Fourth, generally lower lynx populations in southern Canada may be reducing a normal influx of lynx to Montana during cyclic snowshoe hare population highs.

Lack of knowledge of snowshoe hare populations and lynx population dynamics, movements (particularly dispersal), and mortality (especially man-caused) limits the specificity and defensibility of management recommendations. Our recommendations should be considered interim and be revised as additional information becomes available. In this document we are only discussing habitat management, not direct population management through trapping regulations. Population management and trapping are discussed in the literature (Brand and Keith 1979, Quinn and Parker 1987, Brittell et al. 1989) and will not be further considered here. We recommend the following as strategies for

managing lynx habitat (many taken or modified from Brittell et al. (1989), Koehler and Brittell (1990), and Washington Department of Wildlife (1991)):

1) Develop a management plan on a Forest or Multi-Forest basis. Preferably this would be done in conjunction with BLM and Montana DFWP.

2) Survey/monitor lynx in and adjacent to possible lynx management areas. The level of surveying/monitoring would be determine by the management objectives.

If the Elkhorns and Big Belts are to be included as lynx management areas, then the following would be appropriate:

3) Reduce road densities to <1 mile per square mile in lynx management areas.

4) Restrict motorized vehicle (auto, snowmobile, ATV) use of management areas, especially during the trapping season.

5) Landscape management maintain a mosaic of forest age classes in both space and time.

6) Old growth stands of 2.5 ha with high densities of downfall should be maintained for denning habitat and several should be connected by dense travel corridors.

7) Timber management units should be irregularly shaped and 8-16 ha in size.

8) Clearcuts should be less than 100 m wide, or irregularly shaped with periodic constrictions less than 100 m wide.

9) Lodgepole pine should be regenerated in dense stands, and not converted to more economically important species. Stands should reach at least 2-3 m high prior to cutting any adjacent stands.

10) Domestic livestock grazing should be regulated to minimize impacts to snowshoe hare habitat.

11) Snowshoe hare populations should not be controlled.

Literature Cited

Adams, L. 1959. An analysis of a population of snowshoe hares in northwestern Montana. Ecol. Monogr. 29:141-170.

Brainerd, S.M. 1985. Reproductive ecology of bobcats and lynx in western Montana. M.S. Thesis, Univ. Mont., Missoula. 85 pp.

Brand, C.J. and L.B. Keith. 1979. Lynx demography during a snowshoe hare decline in Alberta. J. Wildl. Manage. 43:827-849.

Brand, C.J., L.B. Keith and C.A. Fisher. 1976. Lynx responses to changing snowshoe hare densities in central Alberta. J. Wildl. Manage. 40:416-428.

Brittell, J.D., G.M. Koehler, R.J. Poelker and S.J. Sweeney. 1989. Native cats of Washington. Wash. Dept. Wildl., Olympia. 169 pp.

Brocke, R.H. 1975. Preliminary guidelines for managing snowshoe hare habitat in the Adirondacks. Trans. Northe. Wildl. Soc. Fish Wildl. Conf. 32:46-66.

Burris, O. 1971. Lynx management in Alaska. Pp. 29-33. in: S.E. Jorgensen and L.D. Mech (eds), Proceedings of a symposium on the native cats of North America: their status and management. U.S. Fish Wildl. Serv., Twin Cities, Minn. 139 pp.

Butts, T.W. 1992b. Lynx (Felis lynx) biology and management: a literature review and annotated bibliography. U.S. For. Serv., Region 1: Threatened, Endangered, and Sensitive Species Prog. 115 pp.

Carbyn, L.N. and D. Patriquin. 1983. Observations on home range sizes, movements and social organization of lynx, Lynx canadensis, in Riding Mountain National Park, Manitoba. Can. Field-Nat. 97:262-267.

Dolbeer, R.A. and W.R. Clark. 1975. Population ecology of snowshoe hares in the central Rocky Mountains. J. Wildl. Manage. 39:535-549.

Haglund, B. 1966. Winter habits fo the lynx (Lynx lynx L.) and wolverine (Gulo gulo L.) as revealed by tracking in the snow. Viltrevy 4:81-310.

Hall, E.R. 1981. The mammals of North America, 2nd edition, 2 vols., John Wiley and Sons, New York, N.Y.

Hash, H. 1990. Montana lynx population status and considerations. Mont. Dept. Fish, Wildl. and Parks, Helena.

Hatler, D.F. 1988. A lynx management strategy for British Columbia. Ministry Envir., Vancouver, B.C. 115 pp.

Klein, D.R. 1977. Winter food preferences of snowshoe hares (Lepus americanus) in interior Alaska. Cong. Game Biol. 13:266-275.

Koehler, G.M. 1987. The ecology of the lynx (Lynx canadensis) in

northcentral Washington. Unpubl. Prog. Rep., Wildl. Res. Inst., Univ. Idaho, Moscow. 25 pp.

Koehler, G.M. 1990a. Population and habitat characteristics of lynx and snowshoe hares in north central Washington. Can. J. Zool. 68:845-851.

Koehler, G.M. 1990b. Snowshoe hare, Lepus americanus, use of forest successional stages and population changes during 1985-1989 in north-central Washington. Can. Field-Nat. 105:291-293.

Koehler, G.M. and J.D. Brittell. 1990. Managing spruce-fir habitat for lynx and snowshoe hares. J. Forestry 88:10-14.

Koehler, G.M., M. Hornocker, and H. Hash. 1979. Lynx movements and habitat use in Montana. Can. Field-Nat. 93:441-442.

Litvaitis, J.A., J.A. Sherburne and J.A. Bisonette. 1985. Influence of understory characteristics on snowshoe hare habitat use and density. J. Wildl. Manage. 49:866-873.

Marcot, B.G., R. Holthausen and H. Salwasser. in press. Viable population planning. Conference on Managing Viable Populations. Ann Arbor, Mich., 1984.

McCord, C.M. and J.E. Cardoza. 1982. Bobcat and lynx. Pp. 728-766 in: J.A. Chapman and G.A. Feldhamer (eds), Wild mammals of North America: biology, management, economics. John Hopkins Univ. Press, Baltimore. 1147 pp.

Mech, L.D. 1980. Age, sex, reproduction, and spacial organization of lynx colonizing northeastern Minnesota. J. Mammal. 61:261-267.

Monthey, R.W. 1986. Responses of snowshoe hares, Lepus americanus, to timber harvesting in northern Maine. Can. Field-Nat. 100:568-570.

Nellis, C.H. and L.B. Keith. 1968. Hunting activities and success of lynxes in Alberta. J. Wildl. Manage. 32:718-722.

Nellis, C.H. and S.P. Wetmore. 1969. Long-range movements of lynx in Alberta. J. Mammal. 50:640.

Nellis, C.H., S.P. Wetmore and L.B. Keith. 1972. Lynx-prey interactions in central Alberta. J. Wildl. Manage. 36:320-329.

Parker, G.R., J.W. Maxwell, L.D. Morton and G.E.J. Smith. 1983. the ecology of the lynx (Lynx canadensis) on Cape Breton Island. Can. J. Zool. 61:770-785.

Quinn, N.W.S. and G.R. Parker. 1987. Lynx. Pp. 682-685 in: M.

Novak, J. Baker, M. Obbard, and B. Malloch (eds), Wild furbearer management and conservation in North America. Ministry Nat. Res., Ontario.

Saunders, J.K. 1963. Food habits of the lynx in Newfoundland. J. Wildl. Manage. 27:384-390.

Schonewald-Cox, C.M. 1983. Conclusions: guidelines to management: a beginning attempt. Pp. 414-445. in: Schonewald-Cox, C.M., S.M. Chambers, B. MacBryde, and L. Thomas (eds). Genetics and conservation: a reference for managing wild animal and plant populations. Benjamin/Cummings, London.

Stephenson, R.O. 1986. Development of lynx population estimate techniques. Alaska Dept. Fish and Game, Unpubl. Pittman-Robertson Rep. W-22-2,3,4, Job 7.12R, Juneau, Alaska. 84 pp.

Thompson, L.S. 1982. Distribution of Montana amphibians, reptiles and mammals. Mont. Audubon Council, Helena. 24 pp.

Tumlison, R. 1987. Felis lynx. Mammal. Species 269:1-8.

Ward, R.P.M. 1985. Behavioral responses of lynx to declining snowshoe hare abundance. Unpubl. M.S. Thesis, Univ. B.C., Vancouver. 106 pp.

Ward, R.P.M. and C.J. Krebs. 1985. Behavioral responses of lynx to declining snowshoe hare abundance. Can. J. Zool. 63:2817-2824.

Wolfe, M.L., N.V. Debyln, C.S. Winchell and T.R. McCabe. 1982. Snowshoe hare cover relationships in northern Utah. J. Wildl. Manage. 46:662-670.

Wolff, J.O. 1980. The role of habitat patchiness in the population dynamics of snowshoe hares. Biol. Monogr. 50:111-130.

RECOMMENDATIONS

While this report outlines some management recommendations on individual species, it is not within the scope or intent of this assessment to make site-specific prescriptions for the project area. This work should be applied in the context of the entire landscape of the Big Belt and Elkhorn Mountains, including non-Forest Service lands. It is infeasible and ecologically invalid to apply management for every species in every acre or drainage. Many of these species have markedly different and mutually incompatible habitat requirements.

Managers must strive to provide adequate habitat and conditions to maintain each species at the landscape level. This is not simple a question of "How much habitat?" but of where and in what time frame. For most species, long-term (100+ years) population viability will be assured through maintenance of "large" population size over a broad geographic area. The amount and distribution of habitat required is species-specific and discussed above where information is available. There are currently few models available for planning the amount and distribution of habitat for rare species.

Specific recommendations for each of the nine Sensitive Species are provided in the species accounts above. Listed below are those we feel are the most pressing. Several are surveys which need to be performed to determine the status and distribution of sensitive species in the Elkhorns or Big Belts. Others are necessary prerequisites to establishing appropriate planning for multi-species management in the Elkhorn and Big Belt Mountains.

1. Survey to determine if northern bog lemmings, boreal owls, and flammulated owls are present on the Elkhorns and Big Belt Mountains. Wolverines and lynx surveys should also be given a high priority unless the decision is made to NOT manage for them on this area. Surveys for other sensitive terrestrial vertebrates seem less immediately pressing to us. Black-backed woodpeckers have been seen on the area and Townsend's big-eared bat has been seen south of the area a few miles; both should be assumed present in suitable habitat. Ferruginous hawks and mountain plovers are shrub-steppe species less likely to be drastically affected by current management practices in the short term.

2. Decide if wolverines and lynx will managed for in the Elkhorn and Big Belt Mountains as part of a larger scale management plan.

3. All management activities should address the potential impacts to the sensitive species on the assumption that they are present and vulnerable. This should be done for all EAs and EISs until a management decision is made to NOT manage for a particular species on the district. Multi-year wide scale surveys may show bog lemmings are not present on the area. Since

they will not independently colonize the area, they could be dismissed as a factor in management activities. The other 8 species addressed here can easily disperse into the area, even if not currently present. This may happen on a regular basis for several of the species as habitat changes occur or adjacent populations increase.

LITERATURE CITED

Adams, L. 1959. An analysis of a population of snowshoe hares in northwestern Montana. Ecol. Monogr. 29:141-170.

Adelman, E.V. 1979. A survey of the nongame mammals in the Upper Rattlesnake Creek drainage of Western Montana. M.S. Thesis, Univ. Mont., Missoula. 129 pp.

American Ornithologists' Union. 1983. Check-list of North American birds, 6th ed. 877 pp.

Anon. 1992. Survey techniques to monitor three-toed and black-backed woodpeckers. Unpubl. Rep. Workshop on Monitoring Cavity-Nesters, Feb 24-25, 1992. Sponsored by the Wildl. Soc., Ore. Chapt. 9 pp.

Atkinson, E.C. 1991. Distribution of harlequin ducks (Histrionicus histrionicus) and common loons (Gavia immer) on the Targee National Forest. Coop. Challenge Cost Share Proj. Targee Natl. For. and Id. Dept. Fish Game.

Atkinson, E.C. 1992. Ferruginous Hawk Inventories on the Dillon Resource Area of southwest Montana, 1992. Mont. Nat. Heritage Prog., Helena 34 pp.

Atkinson, E.C. and M.L. Atkinson. 1990. Distribution and status of Flammulated Owls (Otus flammeolus) on the Salmon National Forest. Coop. Challenge Cost Share Proj. Salmon Natl. For. and Id. Dept. Fish Game.

Baldwin, P.H. 1960. Overwintering of woodpeckers in bark beetle-infested spruce-fir forests of Colorado. Proc. 12th Internat. Ornithol. Cong. 12:71-84.

Baldwin, P.H. 1971. Diet of the mountain plover at Pawnee National Grassland, 1970-1971. U.S. Internat. Biol. Prog. Tech. Rep. No. 134.

Banci, V. 1986. The wolverine in the Yukon: myths and management. Discovery 15:134-137.

Banci, V. 1987. Ecology and behavior of wolverine in Yukon. Unpubl. M.S. Thesis, Univ. B.C., Vancouver. 178 pp.

Banci, V. and A. Harestad. 1990. Home range and habitat use of wolverine Gulo gulo in Yukon, Canada. Holarctic Ecol. 13:195-200.

Bechard, M.J. 1981. Historical nest records for the ferruginous hawk in Manitoba. Can. Field-Nat. 95:467-469.

Bent, A.C. 1929. Life histories of North American shorebirds. Part 2. U.S. Natl. Mus. Bull. 146:263-269.

Bent, A.C. 1938. Life histories of North American birds of prey. Part 2. U.S. Natl. Mus. Bull. 170. 466 pp.

Bent, A.C. 1964. Life histories of North American woodpeckers. Dover Publ., Inc., New York, N.Y. 334 pp.

Bergeron, D., C. Jones, D.L. Genter and D. Sullivan. 1992. Montana bird distribution, 4th edition. Mont. Nat. Heritage Prog. Spec. Publ. No. 2. 118 pp.

Black, A. 1992. Ferruginous hawk reproduction and habitat survey. Challenge Cost Share Rep. Bur. Land Manage. N. Rockies Conserv. Coop., Jackson, WY. 30 pp.

Brainerd, S.M. 1985. Reproductive ecology of bobcats and lynx in western Montana. M.S. Thesis, Univ. Mont., Missoula. 85 pp.

Brand, C.J. and L.B. Keith. 1979. Lynx demography during a snowshoe hare decline in Alberta. J. Wildl. Manage. 43:827-849.

Brand, C.J., L.B. Keith and C.A. Fisher. 1976. Lynx responses to changing snowshoe hare densities in central Alberta. J. Wildl. Manage. 40:416-428.

Brelsford, M. 1992a. Boreal owl (Aegolius funereus) and flammulated owl (Otus flammeolus) survey results for the Bozeman District of the Gallatin National Forest. Unpubl. Rep. Mont. Nat. Heritage Prog. 19 pp.

Brelsford, M. 1992b. Boreal owl (Aegolius funereus) and flammulated owl (Otus flammeolus) survey results for the Livingston District of the Gallatin National Forest. Unpubl. Rep. Mont. Nat. Heritage Prog. 22 pp.

Brittell, J.D., G.M. Koehler, R.J. Poelker and S.J. Sweeney. 1989. Native cats of Washington. Wash. Dept. Wildl., Olympia. 169 pp.

Brocke, R.H. 1975. Preliminary guidelines for managing snowshoe hare habitat in the Adirondacks. Trans. Northe. Wildl. Soc. Fish Wildl. Conf. 32:46-66.

Brown, J.H. and A. Kodric-Brown. 1977. Turnover rates in insular biogeography: Effect of immigration on extinction. Ecol. 58:445-449.

Bull, E.L., and R.G. Anderson. 1978. Notes on flammulated owls in northeastern Oregon. Murrelet 59:26-27.

Bull, E.L., S.R. Peterson and J.W. Thomas. 1986. Resource partitioning among woodpeckers in northeastern Oregon. USDA For. Serv., Pac. Northw. Res. Stat. Res. Note PNW-444. 19 pp.

Burris, O. 1971. Lynx management in Alaska. Pp. 29-33. in: S.E. Jorgensen and L.D. Mech (eds), Proceedings of a symposium on the native cats of North America: their status and management. U.S. Fish Wildl. Serv., Twin Cities, Minn. 139 pp.

Burt, W.H. and R.P. Grossenheider. 1976. A field guide to the mammals. 3rd ed. H. Mifflin Co. Boston, Mass. 289 pp.

Butts, T.W. 1992a. Wolverine (Gulo gulo) biology and management: a literature review and annotated bibliography. U.S. For. Serv. Region 1: Threatened, Endangered, and Sensitive Species Prog. 105 pp.

Butts, T.W. 1992b. Lynx (Felis lynx) biology and management: a literature review and annotated bibliography. U.S. For. Serv. Region 1: Threatened, Endangered, and Sensitive Species Prog. 115 pp.

Carbyn, L.N. and D. Patriquin. 1983. Observations on home range sizes, movements and social organization of lynx, Lynx canadensis, in Riding Mountain National Park, Manitoba. Can. Field-Nat. 97:262-267.

Carlson J.C. 1991. Results of boreal owl (Aegolius funereus) surveys on the Jefferson Division of the Lewis and Clark National Forest. Challenge Cost-Share Rep. Lewis and Clark Natl. For., Mont. Nat. Heritage Prog. 30 pp.

Clark, T.W., A.H. Harvey, R.D. Dorn, D.L. Genter, and C. Groves, eds. 1989. Rare, sensitive, and threatened species of the Greater Yellowstone Ecosystem. N. Rockies Conserv. Coop., Mont. Nat. Heritage Prog., The Nat. Conservancy, and Mountain W. Envir. Serv. 153 pp.

Cramp, S. 1985. Handbook of the birds of Europe, the middle East and North Africa, Volume IV. Oxford Univ. Press, London.

Cutler, A. 1991. Nested faunas and extinction in fragmented habitats. Conserv. Biol. 5:496-505.

Dolbeer, R.A. and W.R. Clark. 1975. Population ecology of snowshoe hares in the central Rocky Mountains. J. Wildl. Manage. 39:535-549.

Ensign, J.T. 1983. Nest site selection, productivity, and food habits of ferruginous hawks in southeastern Montana. M.S. thesis. Mont. St. Univ., Bozeman. 83 pp.

Evans, D.L. 1982. Status reports on twelve raptors. Spec. Sci. Rep.--Wildl. No. 238. U.S. Fish Wildl. Serv., Washington, D.C. 70 pp.

FaunaWest Wildlife Consultants. 1991. Status and breeding distribution of the Mountain Plover in Montana. Unpubl. Rep., Bur. Land Manage., Billings. 62 pp.

Federal Register. 1983. Endangered and threatened wildlife and plants. 48 FR 34182, July 27, 1983.

Federal Register. 1991. Endangered and threatened wildlife and plants; animal candidate review for listing as endangered or threatened species. FR 56(225): 58804-58836.

Fitzner, R.E., D. Berry, L.L. Boyd, and C.A. Rieck. 1977. Nesting of ferruginous hawks (Buteo regalis) in Washington, 1974-1975. Condor 79:245-249.

Forsman, E.D. 1981. Habitat utilization by spotted owls on the Eugene District of the Bureau of Land Management. Unpubl. Tech. Rep., USDI Bur. Land Manage. Portland, Ore. 63 pp.

Franklin, J.F. 1988. Structural and functional diversity in temperate forests. pp 166-175 in: E.O. Wilson, ed. Biodiversity. Natl. Academy Press, Washington, D.C.

Franklin, J.F., K. Cromack, W. Denison, A. McKee, C. Maser, J. Sedell, F. Swanson, and G. Juday. 1981. Ecological characteristics of old-growth Douglas-fir forests. USDA For. Serv. Gen. Tech. Rep. PNW-118. Pac. Northw. For. Range Exp. Stat., Portland, Ore. 48 pp.

Franzreb, K.E. and R.D. Ohmart. 1978. The effects of timber harvesting on breeding birds in a mixed coniferous forest. Condor 80:431-441.

Frissell, C.A., R.K. Nawa, and R. Noss. 1992. Is there any conservation biology in "New Perspectives"?: A response to Salwasser. Conserv. Biol. 6:461-464.

Gaines, R.C. 1985. Nest site selection, habitat utilization, and breeding biology of the ferruginous hawk in central North Dakota. M.S. Thesis, N. Dak. St. Univ., Fargo. 32 pp.

Gardner, C.L. 1985. The ecology of wolverines in southcentral Alaska. M.S. Thesis. Univ. Alaska, Fairbanks. 82 pp.

Gardner, C.L., W.B. Ballard and R.H. Jessup. 1986. Long distance movement by and adult wolverine. J. Mammal. 67:603.

Genter, D.L. 1986. Wintering bats of the upper Snake River Plain:

occurrence in lava-tube caves. Great Basin Nat. 46:241-244

Genter, D.L. 1989. Townsend's big-eared bat, Plecotus townsendii. pp. 103-104 in Rare, sensitive, and threatened species of the Greater Yellowstone Ecosystem. T.W. Clark, A.H. Harvey, R.D. Dorn, D.L. Genter, and C. Groves. eds. NRCC, MTNHP, TNC, MWES 153 pp.

Genter, D.L. 1992. Animal species of special concern in Montana. Mont. Nat. Heritage Prog. Helena. 10 pp.

Genter, D.L. and L.H. Metzgar. 1985. Survey of the bat species and their habitat use in Grand Teton National Park. Pp. 65-69 in Univ. Wyo.- Natl. Park Serv. Res. Center, 9th Annual Rep.

Giezentanner, J. B. 1970. Avian distribution and population fluctuations on the shortgrass prairie of north central Colorado. Tech. Rep. 62. Grassland Biome. U.S. Internat. Biol. Prog. 95 pp.

Goggans, R. 1985. Habitat use by flammulated owls in northeastern Oregon. M.S. Thesis, Ore. St. Univ., Corvallis. 54 pp.

Goggans, R., R.D. Dixon and L.C. Seminara. 1989. Habitat use by three-toed and black-backed woodpeckers, Deschutes National Forest, Oregon. Ore. Dept. Fish Wildl. Tech. Rep. 87-3-02. 43 pp.

Graul, W.D. 1973. Adaptive aspects of the mountain plover social system. Living Bird 12:69-94.

Graul, W.D. 1975. Breeding biology of the mountain plover. Wilson Bull. 87:6-31.

Graul, W.D. and L.E. Webster. 1976. Breeding status of the mountain plover. Condor 78:265-267.

Green, P., W. Paradis, and S. Madson. 1991. A landscape approach to fisheries habitat evaluation. USDA For. Serv., Nez Perce Natl. For., Grangeville, Idaho.

Grinnell, A.D. 1963. The neurophysiology of audition in bats: intensity and frequency parameters. J. Physiol., 167: 38-66.

Groves, C. 1988. Distribution of the wolverine in Idaho as determined by mail questionnaire. Northw. Sci. 62:181-185.

Groves, C. and E. Yensen. 1989. Rediscovery of the northern bog lemming (Synaptomys borealis) in Idaho. Northw. Nat. 70:14-15.

Haglund, B. 1966. Winter habits fo the lynx (Lynx lynx L.) and wolverine (Gulo gulo L.) as revealed by tracking in the snow.

Viltrevy 4:81-310.

Hall, E.R. 1981. The mammals of North America, 2nd ed. 2 vols. John Wiley and Sons, New York, N.Y.

Harmata, A. R. 1991. Impacts of oil and gas development on raptors associated with Kevin Rim, Montana. Unpubl. Rep. Mont. St. Univ., Bozeman. 97 pp.

Harris, L.D. 1984. The Fragmented Forest: Island Biogeographic Theory and the Preservation of Biotic Diversity. Univ. Chicago Press, Chicago, Ill. 211 pp.

Harris, M.A. 1982. Habitat use among woodpeckers in forest burns. M.S. Thesis, Univ. Mont., Missoula. 62 pp.

Harrison, R.L. 1992. Toward a theory of inter-refuge corridor design. Conserv. Biol. 6:293-295.

Hash, H.S. 1987. Wolverine. Pp. 574-585 in: M. Novak, J. Baker, M. Obbard, and B. Malloch (eds), Wild furbearer management and conservation in North America. Ministry Nat. Res. Ontario.

Hash, H. 1990. Montana lynx population status and considerations. Mont. Dept. Fish, Wildl. and Parks, Helena.

Hatler, D.F. 1988. A lynx management strategy for British Columbia. B.C. Ministry Environ., Victoria. 115 pp.

Hatler, D.F. 1989. A wolverine management strategy for British Columbia. B.C. Ministry Environ., Victoria, Wildl. Bull. B-60.

Hayward, G.D. 1986. Activity pattern of a pair of nesting flammulated owls (Otus flammeolus) in Idaho. Northw. Sci. 60:141-144.

Hayward, G.D. 1989. Habitat use and population biology of boreal owls in the northern Rocky Mountains, USA. Ph.D. Diss., Univ. Idaho, Moscow. 88 pp.

Hayward, G.D. and P.H. Hayward 1991. Body measurements of Boreal Owls in Idaho an a discriminant model to determine sex of live specimens. Wilson Bull. 103:497-500.

Hayward, G.D., P.H. Hayward, E.O. Garton, and R. Escano. 1987. Revised breeding distribution of the boreal owl in the northern Rocky Mountains. Condor 89:431-432.

Holt, D.W. and D. Ermatinger. 1989. First confirmed nest site of boreal owls in Montana. Northw. Nat. 70:27-31.

Hornocker, M.G. and H.S. Hash. 1981. Ecology of the wolverine in

northwestern Montana. Can. J. Zool. 59:1286-1301.

Houston, C.S. and M.J. Bechard. 1984. Decline of the ferruginous hawk in Saskatchewan. Amer. Birds 38:166-170.

Howell, A.B. 1920. Some Californian experiences with bat roosts. J. Mammal. 1:169-177.

Howie, R.R. and R. Ritcey. 1987. Distribution, habitat selection, and densities of flammulated owls in British Columbia. in: Nero, R. W., C.R. Knapton, and R.J. Hamre, eds., Biology and conservation of northern forest owls: symposium proceedings. Gen. Tech. Rep. RM-142. Fort Collins, Col.: USDA For. Serv., Rocky Mountain For. Range Exp. Stat. 309 pp.

Humphrey, S.R. and T.H. Kunz. 1976. Ecology of a Pleistocene relict, the western big-eared bat (Plecotus townsendii), in the southern Great Plains. J. Mammal. 57:470-494.

Johnsgard, P.A. 1990. Hawks, eagles, and falcons of North America. Smithsonian Inst. Press, Washington, D.C. 403 pp.

Johnson, M.L. and P.W. Cheney. 1953. Synaptomys in Idaho and northeastern Washington. Murrelet 34:10.

Johnson, N.K. 1975. Controls of number of bird species on montane islands in the Great Basin. Evol. 29:545-657.

Jones, J.K., Jr., and E.C. Birney. 1988. Handbook of mammals of the north-central states. Univ. Minn. Press, Minneapolis.

Klein, D.R. 1977. Winter food preferences of snowshoe hares (Lepus americanus) in interior Alaska. Cong. Game Biol. 13:266-275.

Knowles, C.J. and P.R. Knowles. 1984. Additional records of mountain plovers using prairie dog towns in Montana. Prairie Nat. 16:183-186.

Knowles, C.J., C.J. Stoner, and S.P. Gieb. 1982. Selective use of black-tailed prairie dog towns by mountain plovers. Condor 84:71-74.

Koehler, G.M. 1987. The ecology of the lynx (Lynx canadensis) in northcentral Washington. Unpubl. Prog. Rep., Wildl. Res. Inst., Univ. Idaho, Moscow. 25 pp.

Koehler, G.M. 1990a. Population and habitat characteristics of lynx and snowshoe hares in north central Washington. Can. J. Zool. 68:845-851.

Koehler, G.M. 1990b. Snowshoe hare, Lepus americanus, use of

forest successional stages and population changes during 1985-1989 in north-central Washington. Can. Field-Nat. 105:291-293.

Koehler, G.M. and J.D. Brittell. 1990. Managing spruce-fir habitat for lynx and snowshoe hares. J. Forestry 88:10-14.

Koehler, G.M., M. Hornocker, and H. Hash. 1979. Lynx movements and habitat use in Montana. Can. Field-Nat. 93:441-442.

Korpimaki, E. 1981. On the ecology and biology of Tengmalm's Owl (Aegolius funereus) in southern Ostrobothnia and Suomenselka, western Finland. Acta Univ. Ouluensis 118:1-84.

Kunz, T.H. ed. 1988. Ecological and behavioral methods for the study of bats. Smithsonian Inst. Press. Washington, D.C. XXX pp.

Kunz, T.H. and R.A. Martin. 1982. Plecotus townsendii. Mammalian Species 175:1-6.

Laun, C.H. 1957. A life history study of the mountain plover (Eupoda montana Townsend) on the Laramie Plains, Albany County, Wyoming. M.S. Thesis, Univ. Wyo., Laramie.

Layser, E.F. and T.E. Burke. 1973. The northern bog lemming and its unique habitat in northeastern Washington. Murrelet 54:7-8.

Leachman, B. and B. Osmundson. 1990. Status of the mountain plover, a literature review. U.S. Fish Wildl. Serv., Fish Wildl. Enhancement, Golden, Col. 83 pp.

Ligon, J. D. 1968. The biology of the elf owl (Micrathene whitney). Univ. Mich. Mus. Zool. Misc. Publ. 136. 70 pp.

Litvaitis, J.A., J.A. Sherburne and J.A. Bisonette. 1985. Influence of understory characteristics on snowshoe hare habitat use and density. J. Wildl. Manage. 49:866-873.

Lord, J.M. and D.A. Norton. 1990. Scale and the spatial concept of fragmentation. Conserv. Biol. 4:197-202.

MacArthur, R.H. and E.O. Wilson. 1963. An equilibrium theory of insular biogeography. Evol. 17:373-387.

MacArthur, R.H. and E.O. Wilson. 1967. The Theory of Island Biogeography. Princeton Univ. Press, Princeton, NJ.

MacClintock, L., R. Whitcomb, and B. Whitcomb. 1977. Evidence for the value of corridors and minimization of isolation in preservation of biotic diversity. Amer. Birds 31:6-16.

Madsen, M., G. Hanson, D. Genter, and S. Martinez. 1992. Winter surveys of caves in the Pryor Mountains of southcentral Montana. Rep. to USDI Bur. Land Manage., Mont. Nat Heritage Prog., Helena. XXX pp.

Magoun, A.J. 1985. Population characteristics, ecology, and management of wolverines in northwestern Alaska. M.S. Thesis, Univ. Alaska, Fairbanks.

Magoun, A.J. 1987. Summer and winter diets of wolverines Gulo gulo in arctic Alaska. Can. Field-Nat. 101:392-397.

Marcot, B.G., R. Holthausen and H. Salwasser. in press. Viable population planning. Conf. on Managing Viable Pop., Ann Arbor, Michigan, 1984.

Marshall, J.T. 1939. Territorial behavior of the flammulated screech owl. Condor 41:71-78.

McAnnis, D. 1990. Home range, activity budget and habitat use of ferruginous hawks (Buteo regalis) breeding in southwestern Idaho. M.S. thesis. Boise State Univ., Boise, Idaho. 81 pp.

McCallum, D.A. and F.R. Gehlbach. 1988. Nest-site preferences of flammulated owls in western New Mexico. Condor 90:653-661.

McCord, C.M. and J.E. Cardoza. 1982. Bobcat and lynx. Pp. 728-766 in: J.A. Chapman and G.A. Feldhamer (eds), Wild mammals of North America: biology, management, economics. John Hopkins Univ. Press, Baltimore. 1147 pp.

McDonald, K.A. and J.H. Brown. Using montane mammals to model extinctions due to global change. Conserv. Biol. 6:409-415.

McKay, R. 1991. Biological assessment and inventory plan for the wolverine (Gulo gulo) in the Uinta Mountains. Utah Nat. Heritage Prog. and Utah Dept. Nat. Res., Salt Lake City. 58 pp.

Mech, L.D. 1980. Age, sex, reproduction, and spacial organization of lynx colonizing northeastern Minnesota. J. Mammal. 61:261-267.

Middleton, J. and G. Merriam. 1981. Woodland mice in a farmland mosaic. J. Anim. Ecol. 18:703-710.

Mikkola, H. 1983. Owls of Europe. Buteo Books, Vermillion, S.D.

Monthey, R.W. 1986. Responses of snowshoe hares, Lepus americanus, to timber harvesting in northern Maine. Can. Field-Nat. 100:568-570.

Moore, T.L and G.P. Frederick 1991. Distribution and habitat of Flammulated Owls (Otus flammeolus) in west-central Idaho. Coop. Challenge Cost Share Proj. Payette Natl. For., Wallowa-Whitman Natl. For., and Id. Dept. Fish Game.

Moseley, R. and C. Groves. 1990. Rare, threatened and endangered plants and animals of Idaho. Idaho Dept. Fish Game. Boise. 33 pp.

Murphy, J.R. 1978. Management considerations for some western hawks. Trans. N. Amer. Wildl. Nat. Resour. Conf. 43:241-251.

Myers, L.H. 1987. Nesting ecology of ferruginous hawks in S.W. Montana. Paper presented at the Mont. Nongame Symp., Kalispell, Mont. Feb. 11, 1987. 14 pp.

Nellis, C.H. and L.B. Keith. 1968. Hunting activities and success of lynxes in Alberta. J. Wildl. Manage. 32:718-722.

Nellis, C.H. and S.P. Wetmore. 1969. Long-range movements of lynx in Alberta. J. Mammal. 50:640.

Nellis, C.H., S.P. Wetmore and L.B. Keith. 1972. Lynx-prey interactions in central Alberta. J. Wildl. Manage. 36:320-329.

Noss, R.F. 1990. Indicators for monitoring biodiversity: A hierarchical approach. Conserv. Biol. 4:355-364.

Olendorff, R.R. 1973. Ecology of the nesting birds of prey of northeastern Colorado. U.S. Internat. Biol. Prog., Grassland Biome, Fort Collins, Col. Tech. Rep. No. 211. 233 pp.

Olson, S.L. 1984. Density and distribution, nest site selection, and activity of the mountain plover on the Charles M. Russell National Wildlife Refuge. M.S. Thesis, Univ. Mont., Missoula. 62 pp.

Olson, S.L. 1985. Mountain plover food items on and adjacent to a prairie dog town. Prairie Nat. 17:83-90.

Olson, S.L. and D.Edge. 1985. Nest site selection by mountain plovers in northcentral Montana. J. Range Manage. 38:278-280.

Olson-Edge, S.L. and W.D. Edge. 1987. Density and distribution of the mountain plover on the Charles M. Russell National Wildl. Refuge. Prairie Nat. 19:233-238.

Palmer, D.A. and R.A. Ryder. 1984. The first documented breeding of the boreal owl in Colorado. Condor 86:215-217.1986

Parker, G.R., J.W. Maxwell, L.D. Morton and G.E.J. Smith. 1983. the ecology of the lynx (Lynx canadensis) on Cape Breton

Island. Can. J. Zool. 61:770-785.

Pearson, O.P., M.R. Koford, and A.K. Pearson. 1952. Reproduction of the lump-nosed bat (Corynorhinus rafinesquii) in California. J. Mammal. 33:273-320.

Perkins, M. The plight of Plecotus. Bats 2:1-3.

Pierson, E.D. and P.E. Brown. 1992. Saving old mines for bats. Bats 10:11-13.

Pimm, S.A., H.L. Jones, and J. Diamond. 1988. On the risk of extinction. Amer. Nat. 132:757-785.

Poole. J.M. and B.L. Heidel. 1993. Sensitive plant surveys in the Big Belt and Elkhorn Mountains. Mont. Nat. Heritage Prog. for Helena Natl. For., Helena, Mont.

Powers, L.R. and T.H. Craig. 1976. Status of nesting ferruginous hawks in the Little Lost River Valley and vicinity, southeastern Idaho. Murrelet 57:46-47.

Quinn, N.W.S. and G.R. Parker. 1987. Lynx. Pp. 682-685 in: M. Novak, J. Baker, M. Obbard, and B. Malloch (eds), Wild furbearer management and conservation in North America. Ministry Nat. Res., Ontario.

Reel, S., L. Schassberger, and W. Ruediger. 1989. Caring for our natural community: Region 1 - Threatened, Endangered & Sensitive Species Program. USDA For. Serv. N. Region, Missoula, MT. 309 pp. + appendices

Reichel, J.D. 1984. Ecology of Pacific Northwest alpine mammals. Ph.D. thesis, Wash. St. Univ., Pullman. 91 pp.

Reichel, J.D. 1993. Northern bog lemming survey, 1992. Mont. Nat. Heritage Prog. Rep. to Kootenai Nat. For. 29 pp.

Restani, M. 1989. Resource partitioning among three species of hawks in the Centennial Valley, MT. M.S. thesis. Mont. St. Univ., Bozeman. 86 pp.

Restani, M. 1991. Resource partitioning among three Buteo species in the Centennial Valley, Montana. Condor 93:1007-1010.

Reynolds, R.T. 1987. Census of Flammulated Owls. Pp. 308-309. in: Nero, R.W., C.R. Knapton, and R.J. Hamre, eds., Biology and conservation of northern forest owls: symposium proceedings. Gen. Tech. Rep. RM-142. Fort Collins, Col.: USDA For. Serv., Rocky Mountain For. Range Exp. Stat. 309 pp.

Reynolds, R.T. and B.D. Linkhart. 1984. Methods and materials for

capturing and monitoring flammulated owls. Great Basin Nat. 44:49-51.

Reynolds, R.T. and B.D. Linkhart. 1987. The nesting biology of flammulated owls in Colorado. in: Nero, R.W., C.R. Knapton, and R.J. Hamre, eds., Biology and conservation of northern forest owls: symposium proceedings. Gen. Tech. Rep. RM-142. Fort Collins, Col.: USDA For. Serv., Rocky Mountain For. Range Exp. Stat. 309 pp.

Rogers, T.H. 1986. Northern Rocky Mountain-Intermountain Region. Amer. Birds 41:120.

Ryder, R.A., D.A. Palmer, and J.J. Rawinski. 1987.Distribution and status of the boreal owl in Colorado. pp. 169-174 in: Nero, R.W., C.R. Knapton, and R.J. Hamre, eds., Biology and conservation of northern forest owls: symposium proceedings. Gen. Tech. Rep. RM-142. Fort Collins, Col.: USDA For. Serv., Rocky Mountain For. Range Exp. Stat. 309 pp.

Salwasser, H. 1991. New perspectives for sustaining diversity in U.S. National Forest ecosystems. Conservation Biology 5:567-569.

Saunders, D.A., R.J. Hobbs, and C.R. Margules. 1991. Biological consequences of ecosystem fragmentation: A review. Conservation Biology 5:18-32.

Saunders, J.K. 1963. Food habits of the lynx in Newfoundland. J. Wildl. Manage. 27:384-390.

Schmutz, J.K. 1984. Ferruginous hawk and Swainson's hawk abundance and distribution in relation to land use in southeastern Alberta. J. Wildl. Manage. 48:1180-1187.

Schmutz, J.K., R.W. Fyfe, D.A. Moore, and A.R. Smith. 1984. Artificial nests for ferruginous and Swainson's hawks. J. Wildl. Manage. 48:1009-1013.

Schonewald-Cox, C.M. 1983. Conclusions: guidelines to management: a beginning attempt. Pp. 414-445. in: Schonewald-Cox, C.M., S.M. Chambers, B. MacBryde, and L. Thomas (eds). Genetics and conservation: a reference for managing wild animal and plant populations. Benjamin/Cummings, London.

Simberloff, D. and J. Cox. 1987. Consequences and costs of conservation corridors. Conserv. Biol. 1:63-71.

Smith, A.T. and M.M. Peacock. 1990. Conspecific attraction and the determination of metapopulation colonization rates. Conserv. Biol. 4:320-322.

Smith, D.G. and J.R. Murphy. 1973. Breeding ecology of raptors in the eastern Great Basin of Utah. Brigham Young Univ. Sci. Bull. Biol. Ser. 18(3):1-76.

Smith, D.G. and J.R. Murphy. 1982. Nest site selection in raptor communities of the eastern Great Basin. Great Basin Nat. 42:395-404.

Soule, M.E. and K.A. Kohm. 1989. Research Priorities for Conservation Biology. Island Press, Washington, D.C. 97 pp.

Stephenson, R.O. 1986. Development of lynx population estimate techniques. Alaska Dept. Fish and Game, Unpubl. Pittman-Robertson Rep. W-22-2,3,4, Job 7.12R, Juneau, Alaska. 84 pp.

Terborgh, J. 1974. Preservation of natural diversity: The problem of extinction-prone species. Biosci. 24:715-722.

Thomas, D.W. and S.D. West. 1989. Sampling methods for bats. Gen. Tech. Rep. PNW-243 USDA For. Serv., Portland, Ore. 20 pp.

Thomas, D.W. and S.D. West. 1991. Forest age associations of bats in the southern Washington Cascade and Oregon Coast Ranges. in Wildlife and Vegetation of unmanaged Douglas-fir forests. USDA For. Serv. Gen. Tech. Rep. PNW-GTR-285. Portland, Ore. 533 pp.

Thomas, J.W., R.G. Anderson, C. Maser, and E.L. Bull. 1979. Snags. pp 60-77 in: J.W. Thomas, ed., Wildlife habitats in managed forests: The Blue Mountains of Oregon and Washington. USDA For. Serv. Agric. Handbook No. 553.

Thompson, L.S. 1982. Distribution of Montana amphibians, reptiles and mammals. Mont. Audubon Council, Helena. 24 pp.

Tumlison, R. 1987. Felis lynx. Mammal. Species 269:1-8.

Twente, J.W.,Jr. 1955. Some aspects of habitat selection and other behavior of cavern-dwelling bats. Ecol. 36:706-732.

U.S. Fish and Wildlife Service. 1992. Endangered and threatened wildlife and plants; notice of finding on petition to list the ferruginous hawk. Fed. Reg. 57(161):37507-37513. Aug. 19, 1992.

U.S. Forest Service. 1992. DRAFT: Elkhorns landscape analysis documentation, Elkhorn Wildlife Management Unit. U.S. For. Serv., Helena Natl. For., Helena, Mont. 125 pp. + appendices & figures

Ure, J., P. Briggs, and S. W. Hoffman. 1991. Petition to list as endangered the ferruginous hawk (Buteo regalis), as provided by the Endangered Species Act of 1973, as amended in 1982.

Ferruginous Hawk Project, Salt Lake City, Utah. 9 pp.

van Zyll de Jong, C.G. 1975. The distribution and abundance of the wolverine (Gulo gulo) in Canada. Can. Field-Nat. 89:431-437.

van Zyll de Jong, C.G. 1985. Handbook of Canadian mammals. II. Bats. Natl. Mus. Nat. Sci. Ottawa. 212 pp.

Wackenhut, M.C. 1990. Bat species overwintering in lava-tube caves in Lincoln, Gooding, Blaine, Bingham, and Butte counties, Idaho with special reference to annual return of banded Plecotus townsendii. M.S. thesis, Idaho State Univ., Pocatello. 64 pp.

Ward, R.P.M. 1985. Behavioral responses of lynx to declining snowshoe hare abundance. Unpubl. M.S. Thesis, Univ. B.C., Vancouver. 106 pp.

Ward, R.P.M. and C.J. Krebs. 1985. Behavioral responses of lynx to declining snowshoe hare abundance. Can. J. Zool. 63:2817-2824.

Washington Department of Wildlife. 1991. Management recommendations for priority species. Olympia, Wash.

Weckwerth, R.P. and V.D. Hawley. 1962. Marten food habits and population fluctuations in Montana. J. Wildl. Manage. 26:55-74.

Wegner, J.F. and G. Merriam. 1979. Movements by birds and small mammals between a wood and adjoining farmland habitats. J. Appl. Ecol. 16:349-357.

Wershler, C.R. 1989. A management strategy for mountain plovers in Alberta. Proc. Prairie Cons. Endang. Sp. Workshop, Sask. Nat. Hist. Soc. and Can. Plains Res. Cntr. 5 pp.

Whittaker, J.O., Jr., C. Maser, and L.E. Keller. 1977. Food habits of bats of western Oregon. Northw. Sci. 51:46-55.

Wickman, B.E. 1965. Black-backed three-toed woodpecker, Picoides arcticus, predation on Monochamus oregonensis. Pan-Pacific Entomol. 41:162-164.

Wilson, C., R.E. Johnson and J.D. Reichel. 1980. New records for the northern bog lemming in Washington. Murrelet 61:104-106.

Wittenhagen, K.W. 1991. 1991 progress report on the ferruginous hawk in southeastern Montana. Unpubl. Rep. U.S. Bur. Land Manage., Miles City, Mont. 24 pp.

Wittenhagen, K.W. 1992. Final report on the ferruginous hawk in southeastern Montana. Unpubl. Rep. U.S. Bur. Land Manage., Miles City, Mont. 31 pp.

Woffinden, N.D. 1975. Ecology of the ferruginous hawk (Buteo regalis) in central Utah: population dynamics and nest site selection. M.S. thesis. Brigham Young Univ., Provo, Utah. 102 pp.

Woffinden, N.D. and J.R. Murphy. 1989. Decline of a ferruginous hawk population: A 20-year summary. J. Wildl. Manage. 53:1127-1132.

Wolfe, M.L., N.V. Debyln, C.S. Winchell and T.R. McCabe. 1982. Snowshoe hare cover relationships in northern Utah. J. Wildl. Manage. 46:662-670.

Wolff, J.O. 1980. The role of habitat patchiness in the population dynamics of snowshoe hares. Biol. Monogr. 50:111-130.

Wright, P.L. 1950. Synaptomys borealis from Glacier National Park, Montana. J. Mammal. 31:460.

APPENDICES

Appendix 1. Field and PI habitat type query parameters of the Forest Service Timber Stand Data Base and results.

Black-backed woodpecker

Queries limited by: 1) field and PI habitat types:
PIPO, Pinus ponderosa
PICEA, Picea engelmannii
PICO, Pinus contorta

1706 records were selected

Ferruginous hawk

Queries limited by: 1) field and PI habitat types:
Grassland-Steppe
Shrubland-Steppe
Badlands

1931 records were selected

Wolverine

Queries limited by: 1) field and PI habitat types:
Alpine meadow, scrub
ABLA, Abies lasiocarpa
2) PI strata:
5, 5N, 51, 51N, 52, 52N, 53, 53N, 54, 54N, 55, 55N
3) Aspect: S, E, SE

308 records selected

Lynx

Queries limited by: 1) field and PI habitat types:
PICO, Pinus contorta
PICEA, Picea engelmannii
Aspen
Hardwood forests
Woodland draws

1599 records selected

Bog lemming

Queries limited by: 1) field and PI habitat types:
Mountain bottomlands and meadows
CAR series
SAL series

69 records selected

Townsend's big-eared bat

Queries limited by: 1) field and PI habitat types:
PIFL, Pinus flexilis
JUCO, Juniperus communis

226 records selected

Mountain plover

Queries limited by: 1) field and PI habitat types:
Grassland steppe
STCO series, Stipa comata
2) Slope: <= 10 %

12 records selected

Flammulated owl

Queries limited by: 1) field and PI habitat types:
PIPO, Pinus ponderosa
PIPO/AGSP, Pinus ponderosa
Agropyron spicatum
PSME/SPBE, Pseudotsuga menziesii
Spirea betulifolia
Mountain bottomlands
POTRE, Populus tremuloides
POTRI, Populus trichocarpa
2) PI strata:
5, 5N, 51, 51N, 52, 52N, 53, 53N,
54,54N, 55, 55N, 21, 21N, 41, 41N, 43,
43N, 35, 35N, 25, 25N, 15, 15N, 33, 33N,
23, 23N, 13, 13N, 45, 45N
or Not PI strata:
44, 44N, 6, 7, 8, 9, 1, 1N, 2, 2N, 3,
3N, 4, 4N, 42, 42N
3) Elevation: 1200-8000 feet

No records selected

Boreal owl

Queries limited by: 1) field and PI habitat types:
ABLA/CACA, Abies lasiocarpa/
Calamagrostis canadensis
ABLA/XETE, Abies lasiocarpa/
Xerophyllum tenax
PSME/VAGL, Pseudotsuga menziesii/
Vaccinium globulare
PSME/VAGL, Pseudotsuga menziesii/
Vaccinium globulare,
Xerophyllum tenax series
2) PI strata:
21, 21N, 41, 41N 43, 43N, 35, 35N, 25,
25N,15, 15N, 33, 33N, 23, 23N, 13, 13N
or Not PI strata:
6, 7, 8, 9, 45, 45N, 44, 44N, 51, 51N,
52, 52N, 53, 53N, 54, 54N, 55, 55N
3) Elevation: 5000-8500 feet

No records selected

Appendix 2. Detailed query parameters of the Forest Service Timber Stand Data Base for Sensitive wildlife species.

SPECIES	PARAMETERS	CODES Form-Field-Code
Mountain Plover (*Charadrius montanus*)	Contiguous Habitat	(>500 acres)
	Slopes < 10%	21-15- ?
	Forest Type-	
	Short-grass prairie	21-12-NF
	Habitat Type-	
	Grassland Steppe	21-18-015
	STCO series	21-18-016
	Management Area	21-25-RANGE
	Ground Truth	22-29- ?
	PI Habitat Type	22-41-015
		22-41-016
Boreal Owl (*Aegolius funereus*)	Forest Type-	
	Spruce-fir	21-12-SAF
	Lodgepole-Whtbark	21-12-LP
	Elevation(5000-8500')	21-17-067
	Habitat Types-	
	ABLA/CACA	21-18-650
	ABLA/XETE	21-18-690
	PSME/VAGL	21-18-280
	PSME/VAGL (XETE)	21-18-283
	Ground Truth	22-29- ?
	PI Habitat Type	22-41-650
		22-41-690
		22-41-280
		22-41-283
	DBH (13-44")	23-203- ?
	% Cover (35-65% closure)	23-205- ?
	Damage	
	(stem (heart) rots)	23-211-45

SPECIES	PARAMETERS	CODES Form-Field-Code
Flammulated Owl (Otus flammeolus)	Forest Type-	
	Ponderosa Pine	21-12-PP
	Elevation (1200-8000 ft)	21-17-034
	Habitat Type-	
	PIPO	21-18-100
	PIPO/AGSP	21-18-130
	PSME/SPBE	21-18-330
	Mountain Bottomlnds	21-18-060
	POTRE	21-18-078
	POTRI	21-18-079
	Ground Truth	22-29- ?
	PI Habitat	22-41-100
		22-41-130
		22-41-330
		22-41-060
		22-41-078
		22-41-079
	Yr of Origin (before 1910)	22-35- ?
	DBH (12-25")	23-203- ?
	Trees/Acre; % Cover (low stand density) (10-60% closure)	23-205- ?
	Damage (stem(heart) rots)	23-211-45
Ferruginous Hawk (Buteo regalis)	Contiguous Habitat	(>1000 acres)
	Forest Type-	
	Non Forest	21-12-NF
	Habitat Type-	
	Grasslnd-Steppe	21-18-015
	Shrublnd-Steppe	21-18-030
	Badlands	????
	Ground Truth	22-29- ?
	PI Habitat Type	22-41-015
		22-41-030

SPECIES	PARAMETER	CODES Form-Field-Code
Black-backed Woodpecker (*Picoides arcticus*)	Forest Type-	
	Ponderosa Pine	21-12-PP
	Spruce-Alpine Fir	21-12-SAF
	Lodgepole Pine	21-12-LP
	Habitat Type-	
	PIPO	21-18-100
	PICEA	21-18-400
	PICO	21-18-900
	Ground Truth	22-29- ?
	PI Habitat Types	22-41-100
		22-41-400
		22-41-900
	DBH (<50 cm)	23-203- ?
	Height (>15 m)	23-204- ?
	% Cover (mean 46%)	23-205- ?
	Damage-	
	bark beetles	23-211-01
	stem decays	23-211-45
	fire	23-211-92
Bog Lemming (*Synaptomys borealis*)	Contiguous Habitat	(10 acres min)
	Forest Type- Non-forest	21-12-NF
	Habitat Type-	
	Mountain bottomlnds & meadows	21-18-060
	CAR series	22-18-061
	SAL series	22-18-074
	Ground Truth	22-29- ?
	PI Habitat Type	22-41-060
		22-41-061
		22-41-074
Townsend's Big-Eared Bat (*Plecotus townsendii*)	Forest Type-	
	Juniper	21-12-J
	Habitat Type-	
	PIFL/JUCO	21-18-095
	Ground Truth	22-29- ?
	PI Habitat Type	22-41-095

SPECIES	PARAMETERS	CODES Form-Field-Code
Lynx (Felis lynx)	Forest Type-	
	Lodgepole	21-12-LP
	Spruce/Alpine Fir	21-12-SAF
	Habitat Type-	
	PICO	21-18-900
	PICEA	21-18-400
	ASPEN	21-18-078
	Hardwood forests-	
	Woodland Draws	21-18-050
	Ground Truth	22-29- ?
	Yr of origin-	
	(20-40 yrs old)	22-35- ?
	Fuel Load-	
	much down wood >3"	22-37- ?
	PI Habitat Type	22-41-900
		22-41-400
		22-41-050
		22-41-078
Wolverine (Gulo gulo)	Forest Type-	
	Fir	21-12-SAF
	Tundra	21-12-NF
	Aspect-South and East	21-16-S
		21-16-E
	Habitat Type-	
	Alpine mdw, scrub	21-18-080
	Subalpine-fir	21-18-600
	Ground Truth	21-29- ?
	Stand Size Class	
	scattered mature	22-34-SAWT
	Trees/Acre-	
	scattered	23-205- ?

Appendix 3. Survey techniques to monitor black-backed woodpeckers.

SURVEY TECHNIQUES TO MONITOR THREE-TOED AND BLACK-BACKED WOODPECKERS

Workshop on Monitoring Cavity-Nesters, February 24-25, 1992
Sponsored by The Wildlife Society, Oregon Chapter

Three-toed (*Picoides tridactylus*) and black-backed (*Picoides arcticus*) woodpeckers are two of the least known species of woodpeckers in North America. The literature contains only scattered references on nests and behavior, most of which is anecdotal. There are only 2 research studies to date. Bull (1980) collected data in northeastern Oregon as part of a study on niche segregation by sympatric species of woodpeckers. Goggans et al. (1987) collected data in central Oregon on the Deschutes National Forest on habitat use during spring and summer by both species. Therefore, the techniques and recommendations presented herein represent data that is limited in scope - numerically, geographically and seasonally. The monitoring techniques recommended for these species have not undergone the empirical testing that has occurred with pileated woodpeckers. Therefore all recommendations, while representing the best available information, are intended to be dynamic and evolve.

This paper will provide information on species identification using visual and aural cues, general habitat use, and survey techniques to monitor for presence or absence, abundance and reproduction.

Three-toed and black-backed woodpeckers are unique among North American woodpeckers in several respects. Both species have 3 toes on each foot, instead of the usual 4. Both species have a posture whereby the body is positioned at a wide angle to the trunk; these species forage and excavate using body momentum instead of head momentum which is used by most other woodpeckers. Both species have yellow crown patches on the males.

Both woodpeckers are resident in Oregon along the crest of the Cascade Range and eastward across the forested regions. There are also records of the black-backed woodpecker in the Siskiyou Mountain region of southwestern Oregon. While the range of these species is fairly similar in Oregon, the distribution varies. Generally, the three-toed has a slightly higher elevation distribution that the black-backed. On the west slope,

three-toed woodpeckers were not found nesting below 4500 feet elevation, whereas black-backed woodpeckers commonly nested as low as 3000 feet elevation (Goggans et al. 1987).

Both species feed primarily on bark beetle larvae which are obtained by flaking or scaling bark from tree trunks with side-glancing blows. The woodpeckers are thus associated with trees characterized by scaly or flaky bark. However, the woodpeckers differ in the species of trees with which they are associated across their range in North America. The three-toed woodpecker tends to exploit spruce (Picea spp.), and the black-backed woodpecker exploits mainly pine (Pinus spp.). This difference was apparent in data from central Oregon.

In central Oregon, three-toed woodpeckers nested in lodgepole pine forest stands, roosted in hemlock or mixed conifer stands and fo:.. 'd on lodgepole pine and Engelmann spruce trees in primarily mixed conifer stands (Goggans et al. 1987). Mature and overmature stands were selected for home ranges, foraging, and roosting; younger stands and logged areas were avoided. Roosts were in tree cavities in Class 3-4 snags. Dead trees were used during 88% of the foraging observations.

Black-backed woodpeckers nested, roosted and foraged in the same forest types: lodgepole pine and mixed conifer dominated by lodgepole pine. Mature and overmature stands were selected for home ranges, foraging and roosting. Roosts were mainly in tree deformities such as scars, western gall rust cankars or mistletoe clumps rather than cavities. Lodgepole pine trees were used during 97% of the foraging observations. Dead trees were used during 68% of the observations, but 81% of all trees used were infested with mountain pine beetles.

Both species are impacted by timber management because they are dependent upon bark beetle larvae, dead and deformed trees and mature or overmature conditions, particularly for lodgepole pine.

IDENTIFICATION

Both species are 8 - 10 inches long and are black and white, other than the yellow crowns on males Plumage patterns for backs and sides can vary considerably between individuals, particularly for three-toed woodpeckers. Barring on the back varies such that some individuals appear upon first observation to be hairy woodpeckers and others appear to be

three-toed woodpeckers. Although the barring on the sides is more reliably distinct, it may be almost absent on some individuals. Crown plumage on female three-toed and black-backed woodpeckers can vary from solid black to mottled with white. Careful observation is essential to distinguish between some three-toed, black-backed and hairy woodpeckers and between sexes.

COMMUNICATIONS - VOCALIZATIONS AND DRUMMING

Types of communications are numerous and have been analysed extensively using sonagrams (Short 1979). I am limiting discussions here to those relevant for monitoring. Adults rely on variations of 2 types of vocalizations and juveniles on one. Both calls from adult woodpecker are readily distinguished, with practice, from similar calls by other species of woodpeckers. The "pik" call, a single note, is used during intra- and inter-specific encounters as an alarm-threat or location call. The other call is a "rattle" call. It is used as a threat display during inter- and intra-specific interactions and in territorial proclamation. It is an elaboration of the species call note, uttered in series but can incorporate screams and snarls.

The pik call by three-toed woodpeckers is longer, softer and higher pitched than that by black-backed woodpeckers where it sounds constricted and metallic. In hairy woodpeckers the pik call is even longer and higher pitched than in three-toed woodpeckers.

Rattle calls are known for many species of woodpeckers. Generally, this call can be distinguished by species if you can distinguish the pik calls by species. Three-toed woodpeckers are faster and shorter than hairy woodpeckers which are faster and longer than black-backed woodpeckers.

Nestlings have a begging call that changes in volume and sound with age, but is basically a rapid, rattle-like series of notes or buzzes or "churs".

Drumming is used by three-toed and black-backed woodpeckers more than by other species of woodpeckers (Short 1979). Types of drumming can usually be distinguished as fast or slow. Fast drumming signifies a territorial announcement; slow drumming signifies a locational attempt and often occurs at a nest. It is usually steady in tempo and is broadcast softly.

It is common to locate several species of Picidae in one area but species specific drums can also be distinguished with practice. Both three-toed and black-backed woodpeckers have a territorial or fast drum which is steady in tempo until a slight terminal speedup. The three-toed woodpecker drums in slower, shorter bursts with fewer beats than the black-backed woodpecker. The hairy woodpecker is faster in tempo than the black-backed woodpecker and tends to have a terminal slowdown. Flickers drum with a steady cadence without change in tempo. This lack of speedup at end of a drum distinguishes flicker drums from three-toed or black-backed drums. Drums of pileated woodpeckers fall between the tempo of three-toed and black-backed and speedup at the end but are usually easily diagnosed because they are much louder and more resonant than drums of any other species. In order of tempo from fastest to slowest: hairy, black-backed, flicker, pileated, and three-toed. Sapsuckers drums which have double beats are diagnostic.

The best solution to distinguishing woodpeckers calls and drums is field practice whereby each call and drum is verified with a visual observation of the bird. This should be done until the observer can consistently identify which species is calling or drumming. It is essential that observers doing these surveys be trained on the visual and vocal identification of woodpeckers and be given a hearing test to assure accuracy and consistency among observers.

SURVEY FOR PRESENCE OR ABSENCE

Three-toed and black-backed woodpeckers can be located by broadcasting a recording of species-specific drumming. Although this survey technique may not detect all three-toed or black-backed woodpeckers, it appears suitable for determining presence or absence and for monitoring long-term fluctuations in population abundance. The period of time during which woodpeckers respond is brief and the period of monitoring must be adjusted annually to the breeding cycle of the population being monitored. For additional information on breeding chronology see Goggans (1986). Responsiveness to recordings begins with initiation of cavity excavation and ceases when egg-laying begins, a period of approximately 3 weeks. Thus annual variations in climatic conditions and elevation affect timing of responsiveness.

To conduct a drum count, walk a transect stopping for 3 minutes every 0.1 mile. Listen for woodpeckers calling, drumming or the pecking sound that is characteristic of woodpecker foraging. If none are heard after 30 seconds, play-back a recording of a species-specific drum at 30-second intervals. If a bird responds, stop and do not play-back the drum again for 0.25 mile. If drumming play-backs are not discontinued, woodpeckers may follow the observer making it difficult to tell if it is a new bird. Transects should be 0.5 mile apart and laid out so that the observer comes within 0.25 mile of all points on the area. It is important that the cassette tape player broadcasts the sound at levels similar to those produced by drumming woodpeckers; nearby woodpeckers will not respond to extremely loud play-back recordings. If no birds are heard, the transects should be repeated 10 days later. Do not conduct counts during windy or rainy conditions.

Responsiveness to play-back recordings is synchronized with diurnal (i.e. most responsive 1-2 hours after sunrise) and breeding cycles (i.e. increased as woodpeckers approached egg-laying and declined when incubation began) for both species. Therefore drum counts for three-toed woodpeckers should be conducted between 1 May and 15 June. The most effective survey period for 5000-5500 ft. elevation in central Oregon was between 7 May and 7 June (Goggans et al. 1987). There is probably a delay in breeding condition of 4-6 days/≈500 ft gain in elevation, thus surveys at 4500 ft would generally be most effective around the first of May, and surveys at 6000 ft elevation would be most effective around the middle of May. Drum counts should begin 1/2 h after sunrise and end 3.5 h after sunrise.

Responsiveness of black-backed woodpeckers generally begins sooner than responsiveness of three-toed woodpeckers, particularly at lower elevations. Drum counts for black-backed woodpeckers should be conducted between 15 April and 1 June. The most effective survey period for 4300–4400 ft. elevation in central Oregon was between 1 May and 1 June (Goggans et al. 1987). There is probably a delay in breeding condition of 4-6 days/≈500 ft gain in elevation, thus surveys at 4300 ft would be most effective around the first of May, and surveys at 5300 ft elevation would be most effective around the middle of May. Drum counts should begin 1/2 h after sunrise and end 3.5 h after sunrise.

In general, black-backed woodpeckers are more responsive than three-toed woodpeckers. Black-backed woodpeckers continue to respond

throughout the day and the summer, to a limited extent whereas three-toed woodpeckers are unlikely to respond in the afternoon later in the summer.

SURVEY FOR ABUNDANCE

The number of responsive birds seems to give a good approximation of the number of nesting pairs. Generally wherever a woodpecker or pair of woodpeckers responded, a nest was found later (Goggans et al. 1987). Home ranges of three-toed and black-backed woodpeckers may range from 100 - 750 acres per individual. Intra-specific home range overlap appeared limited or nonexistent, except among paired individuals near the nest site (Goggans et al. 1987). Inter-specific home range overlap is common.

NEST LOCATION

Nests of three-toed and black-backed woodpeckers can be located most efficiently during 2 periods of the reproductive cycle. During the period when woodpeckers are excavating cavities, nests can be found by following adults until they visit the excavation site. This can be very difficult. If an adult is lost to view, it may be possible to stimulate the bird to respond to play-back recordings at any time of day by repeated play-backs. Woodpeckers will often be very secretive near nest sites. If you are near a nest, woodpeckers will be most responsive if the recording is played at very low volume, simulating a locational call between members of a pair. Therefore, a combination of low-volume and medium-volume play-backs is most effective at re-locating birds.

Nests may be also be located during the period when nestlings are present by following adults delivering food to the nest. Generally, once a bird has secured a prey item its flight to the nest will be fairly direct. If the nest is distant enough that the bird is lost to view, use a compass to plot the flight path on a map. Repeated locations and plots of flight paths will eventually indicate the area of the nest.

It is very difficult to locate nests during incubation. Adults are extremely secretive and unresponsive to play-back recordings; incubation exchanges occur about every 4 hours, thus a bird approaches the nest only 3 - 4 times daily.

Nests can be readily located when nestlings are present by systematically walking and listening for the sound of nestlings begging for

food. Nestlings of three-toed and black-backed, unlike most picids, call continuously or almost continuously unless alerted to danger. As they near fledging, they can be heard up to 300 ft. from the nest. By quietly approaching a nest, and lightly touching the tree with a stick as though an adult bird was landing you can stimulate juveniles to look out of a cavity.

Nests of black-backed woodpeckers may be readily located and identified because the habit of peeling bark from entrances to nest cavities is common. Cavities in live trees which have the bark peeled from the entrance stand out because of the coloration of the freshly peeled wood. Suspected nests should be verified because hairy woodpeckers nested in a cavity excavated at least in part by black-backed woodpeckers and black-backed woodpeckers nested in a cavity used in the previous year by three-toed woodpeckers. Species occupancy can be verified by observing an incubating adult or nestlings looking out of a cavity or by observing food delivery by an adult. Observation of nest excavation only does not signify nest ownership. Most species of woodpeckers excavate at several cavities each year.

To monitor reproduction, nest status, success and number of young must be determined. Nest status and success can be determined by monitoring occupancy. During incubation, adults exchange incubation duties at approximately 4 hour intervals. Each egg is incubated for about 11 days; hatching is asynchronous. After hatching, adults continue to brood nestlings for 7-14 days and nestlings fledge at about 24 days. Disappearance of the young before this would indicate the nest was unsuccessful. When observing nests, it is imperative to minimize activity and human scent on nest trees because of potential attraction of predators (e.g. chickarees). Three-toed and black-backed eggs and young appear to be very susceptible to predation.

Monitoring production is difficult for three-toed and black-backed woodpeckers. Sex and number of offspring can not be accurately determined from observing nests. Entrances to nest cavities are small, therefore only 1-2 nestlings can be viewed at the cavity entrance. Crown patches distinguishing sex may vary in size and distinctness of color. Production of young has been determined in some species by using lights and mirrors to observe the inside of cavities. This is not as reliable for three-toed and black-backed woodpeckers as for other species because cavity

diameters are small enough that young are piled on top of each other and the dark coloration of young makes them difficult to distinguish. Cavity entrances are too small for adult human hands to penetrate. Only trees which are sound and will not break should be climbed. Live trees with three-toed or black-backed nests have heartrot and are not necessarily safe to climb.

ROOST LOCATION

Location of roosts used by three-toed or black-backed woodpeckers is virtually impossible except incidentally or with radio-telemetry, therefore roost location is not recommended for monitoring. Birds of both species generally fly long distances (e.g. up to 0.5 mile) to roosts therefore can not be followed and generally do not fly to roosts until dusk or near-dark. Roosts are not distinctive and may change nightly. For three-toed woodpeckers summer roost trees are usually dead and highly decayed (Stage 3 or 4 snags). Cavities appear to be old excavations. For black-backed woodpeckers, summer roost trees are usually live but may be dead. Because black-backed woodpeckers do not usually roost in cavities, they are more readily flushed from roosts by disturbance.

LITERATURE

Bull, E. L. 1980. Resource partitioning among woodpeckers in northeastern Oregon. Ph.D. Thesis. University of Idaho. 109pp.

Goggans, Rebecca, Rita D. Dixon and L. Claire Seminara. 1987. Habitat use by three-toed and black-backed woodpeckers, Deschutes National Forest, Oregon. Final Report, Oregon Department of Fish and Wildlife. 50pp.

Short, L.L. 1979. Habits and interactions of North American three-toed woodpeckers. American Museum Novitiates No. 2547:1-42.

REPRODUCTION

HATCH - 11 DAYS

BROOD - 11 - 25 DAYS

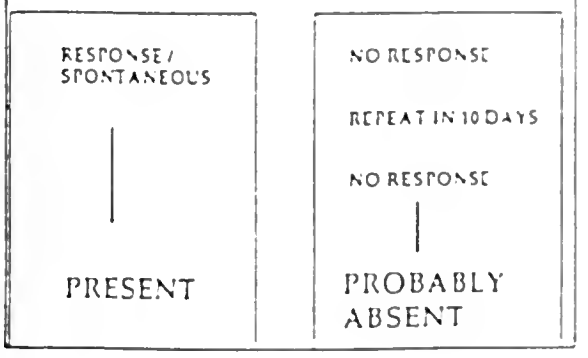
FLEDGE - 35 DAYS

ABUNDANCE

DRUM COUNT

3000 - 5000 ACRES

PRESENCE / ABSENCE



THE END

HAPPY TRAILS

Appendix 4. Vertebrate species actually or potentially found on the Helena National Forest.

MONTANA NATURAL HERITAGE PROGRAM
Vertebrate Species Actually or Potentially Found on the Helena National Forest in the Elkhorn and Big Belt Mountains

Name Common Name	Global Rank	State Rank	State Status	USF&WS Status	USFS Status
FISH:					
ONCORHYNCHUS NERKA KOKANEE	G5	SE5	GF		
ONCORHYNCHUS CLARKI BOUVIERI YELLOWSTONE CUTTHROAT TROUT	G5T3	S2	GF		SENSITIVE
ONCORHYNCHUS CLARKI LEWISI WESTSLOPE CUTTHROAT TROUT	G5T3	S3	GF		SENSITIVE
ONCORHYNCHUS MYKISS RAINBOW TROUT	G5	S5	GF		
PROSOPIUM WILLIAMSONI MOUNTAIN WHITEFISH	G5	S5	GF		
SALMO TRUTTA BROWN TROUT	G5	SE5	GF		
SALVELINUS FONTINALIS BROOK TROUT	G5	SE5	GF		
THYMALLUS ARCTICUS MONTANUS MONTANA ARCTIC GRAYLING	G5T2	S1	GFRH	C1	SENSITIVE
CARASSIUS AURATUS GOLDFISH	G5	SE4	NG		
CYPRINUS CARPIO COMMON CARP	G5	SE5	NG		
GILA ATRARIA UTAH CHUB	G4?	SE4	NG		
HYBOPSIS GRACILIS FLATHEAD CHUB	G5	S5	NG		
PIMEPHALES PROMELAS FATHEAD MINNOW	G5	S5	NG		
PTYCHOCHEILUS OREGONENSIS NORTHERN SQUAWFISH	G5	S5	NG		
RHINICHTHYS CATARACTAE LONGNOSE DACE	G5	S5	NG		
RICHARDSONIUS BALTEATUS REDSIDE SHINER	G5	S5	NG		
CATOSTOMUS CATOSTOMUS LONGNOSE SUCKER	G5	S5	NG		
CATOSTOMUS COMMERSONI WHITE SUCKER	G5	S5	NG		
CATOSTOMUS PLATYRHYNCHUS MOUNTAIN SUCKER	G5	S5	NG		
ICTALURUS MELAS BLACK BULLHEAD	G5	SE5	NG		
NOTURUS FLAVUS STONECAT	G5	S5	NG		
LOTA LOTA BURBOT	G5	S5	GF		
LEPOMIS MACROCHIRUS BLUEGILL	G5	SE5	NG		

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Vertebrate Species Actually or Potentially Found on the Helena National Forest in the Elkhorn and Big Belt Mountains

Name Common Name	Global Rank	State Rank	State Status	USF&WS Status	USFS Status
MICROPTERUS SALMOIDES LARGEMOUTH BASS	G5	SE5	GF		
POMOXIS NIGROMACULATUS BLACK CRAPPIE	G5	SE5	NG		
PERCA FLAVESCENS YELLOW PERCH	G5	SE5	NG		
STIZOSTEDION VITREUM WALLEYE	G5	SE5	GF		
COTTUS BAIRDI MOTTLED SCULPIN	G5	S5	NG		
AMPHIBIANS:					
AMBYSTOMA MACRODACTYLUM LONG-TOED SALAMANDER	G5	S5	NG		
BUFO BOREAS WESTERN TOAD	G5	S4	NG		
PSEUDACRIS TRISERIATA BOREAL CHORUS FROG	G5	S5	NG		
SCAPHIOPUS BOMBIFRONS PLAINS SPADEFOOT	G5	S4?	NG		
RANA PIPIENS NORTHERN LEOPARD FROG	G5	S4	NG		
RANA PRETIOSA SPOTTED FROG	G5	S4	NG	C2	
REPTILES:					
CHRYSEMYS PICTA PAINTED TURTLE	G5	S5	NG		
PHRYNOSOMA DOUGLASSII EASTERN SHORT-HORNED LIZARD	G5	S4	NG		
CHARINA BOTTAE RUBBER BOA	G5	S4	NG		
COLUBER CONSTRICTOR RACER	G5	S5	NG		
HETERODON NASICUS WESTERN HOGNOSE SNAKE	G5	S3?	NG		
PITUOPHIS MELANOLEUCUS BULL SNAKE	G5	S5	NG		
THAMNOPHIS ELEGANS WESTERN TERRESTRIAL GARTER SNAKE	G5	S5	NG		
THAMNOPHIS SIRTALIS COMMON GARTER SNAKE	G5	S5	NG		
CROTALUS VIRIDIS WESTERN RATTLESNAKE	G5	S4	NG		
BIRDS:					
GAVIA IMMER COMMON LOON	G5	S3B,S2N	P		SENSITIVE
PODILYMBUS PODICEPS PIED-BILLED GREBE	G5	S5B,S2N	P		

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Vertebrate Species Actually or Potentially Found on the Helena National Forest in the Elkhorn and Big Belt Mountains

Name Common Name	Global Rank	State Rank	State Status	USF&WS Status	USFS Status
PODICEPS AURITUS HORNED GREBE	G5	S4B,SZN	P		
PODICEPS GRISEGENA RED-NECKED GREBE	G5	S4B,SZN	P		
PODICEPS NIGRICOLLIS EARED GREBE	G5	S5B,SZN	P		
AECHMOPHORUS OCCIDENTALIS WESTERN GREBE	G5	S4B,SZN	P		
PELECANUS ERYTHRORHYNCHOS AMERICAN WHITE PELICAN	G3	S2B,SZN	P		
PHALACROCORAX AURITUS DOUBLE-CRESTED CORMORANT	G5	S5B,SZN	P		
BOTAURUS LENTIGINOSUS AMERICAN BITTERN	G4	S4B,SZN	P		
ARDEA HERODIAS GREAT BLUE HERON	G5	S5B,SZN	P		
CASMERODIUS ALBUS GREAT EGRET	G5	SAN	P		
EGRETTA THULA SNOWY EGRET	G5	SAB,SZN	P		
BUBULCUS IBIS CATTLE EGRET	G5	SAN	P		
BUTORIDES STRIATUS GREEN-BACKED HERON	G5	SAN	P		
NYCTICORAX NYCTICORAX BLACK-CROWNED NIGHT-HERON	G5	S3B,SZN	P		
PLEGADIS CHIHI WHITE-FACED IBIS	G5	S2B,SZN	P	C2	
CYGNUS COLUMBIANUS TUNDRA SWAN	G5	SZN	MB		
CYGNUS BUCCINATOR TRUMPETER SWAN	G4	S1N,S2B	MB	C2	SENSITIVE
CYGNUS OLOR MUTE SWAN	G5	SE	?		
ANSER ALBIFRONS GREATER WHITE-FRONTED GOOSE	G5	SZN	MB		
CHEN CAERULESCENS SNOW GOOSE	G5	S4N	MB		
CHEN ROSSII ROSS' GOOSE	G4?	S4N	MB		
BRANTA CANADENSIS CANADA GOOSE	G5	S5B,SZN	MB		
AIX SPONSA WOOD DUCK	G5	S5B,SZN	MB		
ANAS CRECCA GREEN-WINGED TEAL	G5	S5B,SZN	MB		

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Vertebrate Species Actually or Potentially Found on the Helena National Forest in the Elkhorn and Big Belt Mountains

Name Common Name	Global Rank	State Rank	State Status	USF&WS Status	USFS Status
ANAS RUBRIPES AMERICAN BLACK DUCK	G4	SAN	MB		
ANAS PLATYRHYNCHOS MALLARD	G5	S5B,S5N	MB		
ANAS ACUTA NORTHERN PINTAIL	G5	S5B,S2N	MB		
ANAS DISCORS BLUE-WINGED TEAL	G5	S5B,S2N	MB		
ANAS CYANOPTERA CINNAMON TEAL	G5	S5B,S2N	MB		
ANAS CLYPEATA NORTHERN SHOVELER	G5	S5B,S2N	MB		
ANAS STREPERA GADWALL	G5	S5B,S2N	MB		
ANAS AMERICANA AMERICAN WIGEON	G5	S5B,S2N	MB		
AYTHYA VALISINERIA CANVASBACK	G5	S5B,S2N	MB		
AYTHYA AMERICANA REDHEAD	G5	S5B,S2N	MB		
AYTHYA COLLARIS RING-NECKED DUCK	G5	S5B,S2N	MB		
AYTHYA MARILA GREATER SCAUP	G5	SAN	MB		
AYTHYA AFFINIS LESSER SCAUP	G5	S5B,S2N	MB		
HISTRIONICUS HISTRIONICUS HARLEQUIN DUCK	G5	S2B,S2N	MB	C2	SENSITIVE
CLANGULA HYEMALIS OLDSQUAW	G5	SAN	MB		
MELANITTA PERSPICILLATA SURF SCOTER	G5	SAN	MB		
MELANITTA FUSCA WHITE-WINGED SCOTER	G5	SAN	MB		
BUCEPHALA CLANGULA COMMON GOLDENEYE	G5	S5B,S5N	MB		
BUCEPHALA ISLANDICA BARROW'S GOLDENEYE	G5	S5B,S2N	MB		
BUCEPHALA ALBEOLA BUFFLEHEAD	G5	S5B,S2N	MB		
LOPHODYTES CUCULLATUS HOODED MERGANSER	G5	S4B,S2N	MB		
MERGUS MERGANSER COMMON MERGANSER	G5	S5B,S2N	MB		
MERGUS SERRATOR RED-BREASTED MERGANSER	G5	S2N	MB		
OXYURA JAMAICENSIS RUDDY DUCK	G5	S5B,S2N	MB		

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CATHARTES AURA TURKEY VULTURE	G5	S4B,SZN	P		
PANDION HALIAETUS OSPREY	G5	S5B,SZN	P		
HALIAEETUS LEUCOCEPHALUS BALD EAGLE	G3	S3B,S3N	P	LELT	ENDANGERED
CIRCUS CYANEUS NORTHERN HARRIER	G5	S4B,SZN	P		
ACCIPITER STRIATUS SHARP-SHINNED HAWK	G5	S4B,SZN	P		
ACCIPITER COOPERII COOPER'S HAWK	G4	S4B,SZN	P		
ACCIPITER GENTILIS NORTHERN GOSHAWK	G5	S4	P	C2	
BUTEO SWAINSONI SWAINSON'S HAWK	G4	S5B,SZN	P	3C	
BUTEO JAMAICENSIS RED-TAILED HAWK	G5	S5B,SZN	P		
BUTEO REGALIS FERRUGINOUS HAWK	G4	S3B,SZN	P	C2	SENSITIVE
BUTEO LAGOPUS ROUGH-LEGGED HAWK	G5	S5N	P		
AQUILA CHRYSAETOS GOLDEN EAGLE	G4	S4	P		
FALCO SPARVERIUS AMERICAN KESTREL	G5	S5B,SZN	P		
FALCO COLUMBARIUS MERLIN	G4	S4	P		
FALCO PEREGRINUS PEREGRINE FALCON	G3	S1S2B,SZN	E	LE	ENDANGERED
FALCO RUSTICOLUS GYRFALCON	G5	SZN	P		
FALCO MEXICANUS PRAIRIE FALCON	G5	S4	P		
PERDIX PERDIX GRAY PARTRIDGE	G5	SE4	UB		
ALECTORIS CHUKAR CHUKAR	G5	SE4	UB		
PHASIANUS COLCHICUS RING-NECKED PHEASANT	G5	SE5	UB		
DENDRAGAPUS CANADENSIS SPRUCE GROUSE	G5	S4	UB		
DENDRAGAPUS OBSCURUS BLUE GROUSE	G5	S5	UB		
LAGOPUS LEUCURUS WHITE-TAILED PTARMIGAN	G5	S3	UBCS		

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Name Common Name	Global Rank	State Rank	State Status	USF&WS Status	USFS Status
BONASA UMBELLUS RUFFED GROUSE	G5	S5	UB		
CENTROCERCUS UROPHASIANUS SAGE GROUSE	G5	S5	UB		
TYMPANUCHUS PHASIANELLUS SHARP-TAILED GROUSE	G5	S5	UB		SENSITIVE
MELEAGRIS GALLOPAVO WILD TURKEY	G5	SE5	UB		
RALLUS LIMICOLA VIRGINIA RAIL	G5	S5B,S2N	MBCS		
PORZANA CAROLINA SORA	G5	S5B,S2N	MBCS		
FULICA AMERICANA AMERICAN COOT	G5	S5B,S2N	MB		
GRUS CANADENSIS SANDHILL CRANE	G5	S2N,S5B	MB		
GRUS AMERICANA WHOOPING CRANE	G1	SHN	E	LE	ENDANGERED
PLUVIALIS SQUATAROLA BLACK-BELLIED PLOVER	G5	S2N	P		
PLUVIALIS DOMINICA LESSER GOLDEN-PLOVER	G5	S2N	P		
CHARADRIUS ALEXANDRINUS SNOWY PLOVER	G4?	SAB,SAN	P	C2	
CHARADRIUS SEMIPALMATUS SEMIPALMATED PLOVER	G5	S2N	P		
CHARADRIUS MELODUS PIPING PLOVER	G3	S2B,S2N	P	LELT	THREATENED
CHARADRIUS VOCIFERUS KILLDEER	G5	S5B,S2N	P		
CHARADRIUS MONTANUS MOUNTAIN PLOVER	G3	S2B,S2N	P	C2	SENSITIVE
HIMANTOPUS MEXICANUS BLACK-NECKED STILT	G5	S3B,S2N	P		
RECURVIROSTRA AMERICANA AMERICAN AVOCET	G5	S5B,S2N	P		
TRINGA MELANOLEUCA GREATER YELLOWLEGS	G5	S2N	P		
TRINGA FLAVIPES LESSER YELLOWLEGS	G5	S2N	P		
TRINGA SOLITARIA SOLITARY SANDPIPER	G5	S2N	P		
CATOPTROPHORUS SEMIPALMATUS WILLET	G5	S5B,S2N	P		
ACTITIS MACULARIA SPOTTED SANDPIPER	G5	S5B,S2N	P		
BARTRAMIA LONGICAUDA UPLAND SANDPIPER	G5	S4B,S2N	P		

MONTANA NATURAL HERITAGE PROGRAM
Vertebrate Species Actually or Potentially Found on the Helena National Forest in the Elkhorn and Big Belt Mountains

Name Common Name	Global Rank	State Rank	State Status	USF&WS Status	USFS Status
NUMENIUS PHAEOPUS WHIMBREL	G5	S2N	P		
NUMENIUS AMERICANUS LONG-BILLED CURLEW	G5	S4B,S2N	P	3C	
LIMOSA FEDOA MARBLED GODWIT	G5	S4B,S2N	P		
ARENARIA INTERPRES RUDDY TURNSTONE	G5	S2N	P		
CALIDRIS ALBA SANDERLING	G5	S2N	P		
CALIDRIS PUSILLA SEMIPALMATED SANDPIPER	G5	S2N	P		
CALIDRIS MAURI WESTERN SANDPIPER	G5	S2N	P		
CALIDRIS MINUTILLA LEAST SANDPIPER	G5	S2N	P		
CALIDRIS BAIRDII BAIRD'S SANDPIPER	G4	S2N	P		
CALIDRIS MELANOTOS PECTORAL SANDPIPER	G5	S2N	P		
CALIDRIS ALPINA DUNLIN	G5	S2N	P		
CALIDRIS HIMANTOPUS STILT SANDPIPER	G5	S2N	P		
TRYNGITES SUBRUFICOLLIS BUFF-BREASTED SANDPIPER	G4	SAN	P		
LIMNODROMUS SCOLOPACEUS LONG-BILLED DOWITCHER	G5	S2N	P		
GALLINAGO GALLINAGO COMMON SNIPE	G5	S5B,S2N	MB		
PHALAROPUS TRICOLOR WILSON'S PHALAROPE	G5	S5B,S2N	P		
PHALAROPUS LOBATUS RED-NECKED PHALAROPE	G5	S2N	P		
STERCORARIUS POMARINUS POMARINE JAEGER	G5	SAN	P		
STERCORARIUS PARASITICUS PARASITIC JAEGER	G5	SAN	P		
LARUS PIPIXCAN FRANKLIN'S GULL	G5	S4B,S2N	P		
LARUS PHILADELPHIA BONAPARTE'S GULL	G5	S2N	P		
LARUS DELAWARENSIS RING-BILLED GULL	G5	S5B,S2N	P		
LARUS CALIFORNICUS CALIFORNIA GULL	G5	S5B,S2N	P		

MONTANA NATURAL HERITAGE PROGRAM
Vertebrate Species Actually or Potentially Found on the Helena National Forest in the Elkhorn and Big Belt Mountains

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LARUS ARGENTATUS HERRING GULL	G5	SAB,SZN	P		
LARUS GLAUCOIDES ICELAND GULL	G5	SAN	P		
STERNA CASPIA CASPIAN TERN	G5	S3B,SZN	P		
STERNA HIRUNDO COMMON TERN	G5	S3B,SZN	P		
STERNA FORSTERI FORSTER'S TERN	G5	S3B,SZN	P		
CHLIDONIAS NIGER BLACK TERN	G4	S3B,SZN	P	C2	
SYNTHLIBORAMPHUS ANTIQUUS ANCIENT MURRELET	G5?	SAN	P		
COLUMBA LIVIA ROCK DOVE	G5	SE5	U		
COLUMBA FASCIATA BAND-TAILED PIGEON	G5	SAN	P		
ZENAIDA MACROURA MOURNING DOVE	G5	S5B,SZN	MB		
COCCYZUS ERYTHROPTHALMUS BLACK-BILLED CUCKOO	G5	S4B,SZN	P		
COCCYZUS AMERICANUS YELLOW-BILLED CUCKOO	G5	S3B,SZN	P		
OTUS FLAMMEOLUS FLAMMULATED OWL	G4	S1S3B,SZN	P		SENSITIVE
BUBO VIRGINIANUS GREAT HORNED OWL	G5	S5	P		
NYCTEA SCANDIACA SNOWY OWL	G5	SZN	P		
GLAUCIDIUM GNOMA NORTHERN PYGMY-OWL	G5	S4	P		
SPEOTYTO CUNICULARIA BURROWING OWL	G5	S3B,SZN	P		
STRIX VARIA BARRED OWL	G5	S4	P		
STRIX NEBULOSA GREAT GRAY OWL	G5	S3	P		
ASIO OTUS LONG-EARED OWL	G5	S5	P		
ASIO FLAMMEUS SHORT-EARED OWL	G5	S4	P		
AEGOLIUS FUNEREUS BOREAL OWL	G5	S3	P		SENSITIVE
AEGOLIUS ACADICUS NORTHERN SAW-WHET OWL	G5	S4	P		
CHORDEILES MINOR COMMON NIGHTHAWK	G5	S5B,SZN	P		

MONTANA NATURAL HERITAGE PROGRAM
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PHALAENOPTILUS NUTTALLII COMMON POORWILL	G5	S4B,SZN	P		
CYPSELOIDES NIGER BLACK SWIFT	G4	S3B,SZN	P		
CHAETURA PELAGICA CHIMNEY SWIFT	G5	S4B,SUN	P		
CHAETURA VAUXI VAUX'S SWIFT	G5	S4B,SZN	P		
AERONAUTES SAXATALIS WHITE-THROATED SWIFT	G5	S5B,SZN	P		
ARCHILOCHUS ALEXANDRI BLACK-CHINNED HUMMINGBIRD	G5	S4B,SZN	P		
STELLULA CALLIOPE CALLIOPE HUMMINGBIRD	G5	S5B,SZN	P		
SELASPHORUS RUFUS RUFOUS HUMMINGBIRD	G5	S5B,SZN	P		
CERYLE ALCYON BELTED KINGFISHER	G5	S5B,SZN	P		
MELANERPES LEWIS LEWIS' WOODPECKER	G4	S4B,SZN	P		
MELANERPES ERYTHROCEPHALUS RED-HEADED WOODPECKER	G5	S5B,SZN	P		
SPHYRAPICUS VARIUS YELLOW-BELLIED SAPSUCKER	G5	SAN	P		
SPHYRAPICUS THYROIDEUS WILLIAMSON'S SAPSUCKER	G5	S4B,SZN	P		
PICOIDES PUBESCENS DOWNY WOODPECKER	G5	S5	P		
PICOIDES VILLOSUS HAIRY WOODPECKER	G5	S5	P		
PICOIDES TRIDACTYLUS THREE-TOED WOODPECKER	G5	S5	P		
PICOIDES ARCTICUS BLACK-BACKED WOODPECKER	G5	S3	P		SENSITIVE
COLAPTES AURATUS NORTHERN FLICKER	G5	S5	P		
DRYOCOPUS PILEATUS PILEATED WOODPECKER	G5	S4	P		
CONTOPUS BOREALIS OLIVE-SIDED FLYCATCHER	G5	S5B,SZN	P		
CONTOPUS SORDIDULUS WESTERN WOOD-PEWEE	G5	S5B,SZN	P		
EMPIDONAX TRAILLII WILLOW FLYCATCHER	G5	S5B,SZN	P		
EMPIDONAX MINIMUS LEAST FLYCATCHER	G5	S5B,SZN	P		

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Name Common Name	Global Rank	State Rank	State Status	USF&WS Status	USFS Status
EMPIDONAX HAMMONDII HAMMOND'S FLYCATCHER	G5	S4B,S2N	P		
EMPIDONAX OBERHOLSERI DUSKY FLYCATCHER	G5	S5B,S2N	P		
EMPIDONAX DIFFICILIS WESTERN FLYCATCHER	G5	S5	P		
SAYORNIS SAYA SAY'S PHOEBE	G5	S5B,S2N	P		
MYIARCHUS CINERASCENS ASH-THROATED FLYCATCHER	G5	SAN	P		
TYRANNUS VERTICALIS WESTERN KINGBIRD	G5	S5B,S2N	P		
TYRANNUS TYRANNUS EASTERN KINGBIRD	G5	S5B,S2N	P		
EREMOPHILA ALPESTRIS HORNED LARK	G5	S5B,S5N	P		
TACHYCINETA BICOLOR TREE SWALLOW	G5	S5B,S2N	P		
TACHYCINETA THALASSINA VIOLET-GREEN SWALLOW	G5	S5B,S2N	P		
STELGIDOPTERYX SERRIPENNIS NORTHERN ROUGH-WINGED SWALLOW	G5	S5B,S2N	P		
RIPARIA RIPARIA BANK SWALLOW	G5	S5B,S2N	P		
HIRUNDO PYRRHONOTA CLIFF SWALLOW	G5	S5B,S2N	P		
HIRUNDO RUSTICA BARN SWALLOW	G5	S5B,S2N	P		
PERISOREUS CANADENSIS GRAY JAY	G5	S5	P		
CYANOCITTA STELLERI STELLER'S JAY	G5	S5	P		
CYANOCITTA CRISTATA BLUE JAY	G5	SAB,S2N	P		
GYMNORHINUS CYANOCEPHALUS PINYON JAY	G5	S4	P		
NUCIFRAGA COLUMBIANA CLARK'S NUTCRACKER	G5	S5	P		
PICA PICA BLACK-BILLED MAGPIE	G5	S5	U		
CORVUS BRACHYRHYNCHOS AMERICAN CROW	G5	S5B,S2N	U		
CORVUS CORAX COMMON RAVEN	G5	S5	P		
PARUS ATRICAPILLUS BLACK-CAPPED CHICKADEE	G5	S5	P		
PARUS GAMBELI MOUNTAIN CHICKADEE	G5	S5	P		

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PARUS HUDSONICUS BOREAL CHICKADEE	G5	S3	P		
PARUS RUFESCENS CHESTNUT-BACKED CHICKADEE	G5	S4	P		
SITTA CANADENSIS RED-BREASTED NUTHATCH	G5	S5	P		
SITTA CAROLINENSIS WHITE-BREASTED NUTHATCH	G5	S4	P		
SITTA PYGMAEA PYGMY NUTHATCH	G5	S4	P		
CERTHIA AMERICANA BROWN CREEPER	G5	S5	P		
SALPINCTES OBSOLETUS ROCK WREN	G5	S5B,SZN	P		
CATHERPES MEXICANUS CANYON WREN	G5	S4	P		
TROGLODYTES AEDON HOUSE WREN	G5	S5B,SZN	P		
TROGLODYTES TROGLODYTES WINTER WREN	G5	S5	P		
CISTOTHORUS PALUSTRIS MARSH WREN	G5	S5B,SZN	P		
CINCLUS MEXICANUS AMERICAN DIPPER	G5	S5	P		
REGULUS SATRAPA GOLDEN-CROWNED KINGLET	G5	S5	P		
REGULUS CALENDULA RUBY-CROWNED KINGLET	G5	S5B,SZN	P		
SIALIA MEXICANA WESTERN BLUEBIRD	G5	S4B,SZN	P		
SIALIA CURRUCOIDES MOUNTAIN BLUEBIRD	G5	S5B,SZN	P		
MYADESTES TOWNSENDI TOWNSEND'S SOLITAIRE	G5	S5	P		
CATHARUS FUSCESCENS VEERY	G5	S5B,SZN	P		
CATHARUS USTULATUS SWAINSON'S THRUSH	G5	S5B,SZN	P		
CATHARUS GUTTATUS HERMIT THRUSH	G5	S5B,SZN	P		
TURDUS MIGRATORIUS AMERICAN ROBIN	G5	S5B,SZN	P		
IXOREUS NAEVIUS VARIED THRUSH	G5	S5B,SZN	P		
DUMETELLA CAROLINENSIS GRAY CATBIRD	G5	S5B,SZN	P		

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MIMUS POLYGLOTTOS MOCKINGBIRD	G5	SAB,SZN	P		
OREOSCOPTES MONTANUS SAGE THRASHER	G5	S5B,SZN	P		
TOXOSTOMA RUFUM BROWN THRASHER	G5	S5B,SZN	P		
ANTHUS RUBESCENS WATER PIPIT	G5	S5B,SZN	P		
ANTHUS SPRAGUEII SPRAGUE'S PIPIT	G4	S4B,SZN	P		
BOMBYCILLA GARRULUS BOHEMIAN WAXWING	G5	S4B,S5N	P		
BOMBYCILLA CEDRORUM CEDAR WAXWING	G5	S5B,SZN	P		
LANIUS EXCUBITOR NORTHERN SHRIKE	G5	S5N	P		
LANIUS LUDOVICIANUS LOGGERHEAD SHRIKE	G4	S4B,SZN	P	C2	
STURNUS VULGARIS EUROPEAN STARLING	G5	SE5	U		
VIREO SOLITARIUS SOLITARY VIREO	G5	S5B,SZN	P		
VIREO GILVUS WARBLING VIREO	G5	S5B,SZN	P		
VIREO OLIVACEUS RED-EYED VIREO	G5	S5B,SZN	P		
VERMIVORA PEREGRINA TENNESSEE WARBLER	G5	S3S4B,SZN	P		
VERMIVORA CELATA ORANGE-CROWNED WARBLER	G5	S5B,SZN	P		
VERMIVORA RUFICAPILLA NASHVILLE WARBLER	G5	S5B,SZN	P		
DENDROICA PETECHIA YELLOW WARBLER	G5	S5B,SZN	P		
DENDROICA MAGNOLIA MAGNOLIA WARBLER	G5	SAN	P		
DENDROICA CORONATA YELLOW-RUMPED WARBLER	G5	S5B,SZN	P		
DENDROICA NIGRESCENS BLACK-THROATED GRAY WARBLER	G5	SAN	P		
DENDROICA TOWNSENDI TOWNSEND'S WARBLER	G5	S5B,SZN	P		
DENDROICA STRIATA BLACKPOLL WARBLER	G5	SZN	P		
MNIOTILTA VARIA BLACK-AND-WHITE WARBLER	G5	S1S3B,SZN	P		
SETOPHAGA RUTICILLA AMERICAN REDSTART	G5	S5B,SZN	P		

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SEIURUS AUROCAPILLUS OVENBIRD	G5	S5B,SZN	P		
SEIURUS NOVEBORACENSIS NORTHERN WATERTHRUSH	G5	S5B,SZN	P		
OPORORNIS TOLMIEI MACGILLIVRAY'S WARBLER	G5	S5B,SZN	P		
GEOTHLYPIS TRICHAS COMMON YELLOWTHROAT	G5	S5B,SZN	P		
WILSONIA PUSILLA WILSON'S WARBLER	G5	S5B,SZN	P		
ICTERIA VIRENS YELLOW-BREASTED CHAT	G5	S5B,SZN	P		
PIRANGA OLIVACEA SCARLET TANAGER	G5	SAN	P		
PIRANGA LUDOVICIANA WESTERN TANAGER	G5	S5B,SZN	P		
PHEUCTICUS LUDOVICIANUS ROSE-BREASTED GROSBEAK	G5	SAB,SZN	P		
PHEUCTICUS MELANOCEPHALUS BLACK-HEADED GROSBEAK	G5	S5B,SZN	P		
PASSERINA AMOENA LAZULI BUNTING	G5	S5B,SZN	P		
PASSERINA CYANEA INDIGO BUNTING	G5	S2S4B,SZN	P		
PIPILO CHLORURUS GREEN-TAILED TOWHEE	G5	S4B,SZN	P		
PIPILO ERYTHROPHTHALMUS RUFOUS-SIDED TOWHEE	G5	S5B,SZN	P		
SPIZELLA ARBOREA TREE SPARROW	G5	SZN	P		
SPIZELLA PASSERINA CHIPPING SPARROW	G5	S5B,SZN	P		
SPIZELLA PALLIDA CLAY-COLORED SPARROW	G5	S4B,SZN	P		
SPIZELLA BREWERI BREWER'S SPARROW	G5	S4B,SZN	P		
POOECETES GRAMINEUS VESPER SPARROW	G5	S5B,SZN	P		
CHONDESTES GRAMMACUS LARK SPARROW	G5	S5B,SZN	P		
CALAMOSPIZA MELANOCORYS LARK BUNTING	G5	S5B,SZN	P		
PASSERCULUS SANDWICHENSIS SAVANNAH SPARROW	G5	S5B,SZN	P		
AMMODRAMUS BAIRDII BAIRD'S SPARROW	G3	S3S4B,SZN	P	C2	

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Name Common Name	Global Rank	State Rank	State Status	USF&WS Status	USFS Status
AMMODRAMUS SAVANNARUM GRASSHOPPER SPARROW	G4	S4B,SZN	P		
PASSERELLA ILIACA FOX SPARROW	G5	S5B,SZN	P		
MELOSPIZA MELODIA SONG SPARROW	G5	S5B,SZN	P		
MELOSPIZA LINCOLNII LINCOLN'S SPARROW	G5	S5B,SZN	P		
ZONOTRICHIA ALBICOLLIS WHITE-THROATED SPARROW	G5	SZN	P		
ZONOTRICHIA LEUCOPHRYS WHITE-CROWNED SPARROW	G5	S5B,SZN	P		
ZONOTRICHIA QUERULA HARRIS' SPARROW	G5	SZN	P		
JUNCO HYEMALIS DARK-EYED JUNCO	G5	S5B,SZN	P		
CALCARIUS MCCOWNII MCCOWN'S LONGSPUR	G4?	S5B,SZN	P		
CALCARIUS LAPPONICUS LAPLAND LONGSPUR	G5	SZN	P		
CALCARIUS ORNATUS CHESTNUT-COLLARED LONGSPUR	G5	S5B,SZN	P		
PLECTROPHENAX NIVALIS SNOW BUNTING	G5	S5N	P		
DOLICHONYX ORYZIVORUS BOBOLINK	G5	S4B,SZN	P		
AGELAIUS PHOENICEUS RED-WINGED BLACKBIRD	G5	S5B,SZN	U		
STURNELLA NEGLECTA WESTERN MEADOWLARK	G5	S5B,SZN	P		
XANTHOCEPHALUS XANTHOCEPHALUS YELLOW-HEADED BLACKBIRD	G5	S5B,SZN	U		
EUPHAGUS CAROLINUS RUSTY BLACKBIRD	G5	SZN	U		
EUPHAGUS CYANOCEPHALUS BREWER'S BLACKBIRD	G5	S5B,SZN	U		
QUISCALUS QUISCULA COMMON GRACKLE	G5	S5B,SZN	P		
MOLOTHRUS ATER BROWN-HEADED COWBIRD	G5	S5B,SZN	P		
ICTERUS GALBULA NORTHERN ORIOLE	G5	S5B,SZN	P		
LEUCOSTICTE ARCTOA ROSY FINCH	G5	S5B,S5N	P		
PINICOLA ENUCLEATOR PINE GROSBEAK	G5	S5	P		
CARPODACUS PURPUREUS PURPLE FINCH	G5	SAN	P		

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CARPODACUS CASSINII CASSIN'S FINCH	G5	S5	P		
CARPODACUS MEXICANUS HOUSE FINCH	G5	S5	P		
LOXIA CURVIROSTRA RED CROSSBILL	G5	S5	P		
LOXIA LEUCOPTERA WHITE-WINGED CROSSBILL	G5	S4	P		
CARDUELIS FLAMMEA COMMON REDPOLL	G5	S5N	P		
CARDUELIS HORNEMANNI HOARY REDPOLL	G5?	S2N	P		
CARDUELIS PINUS PINE SISKIN	G5	S5	P		
CARDUELIS TRISTIS AMERICAN GOLDFINCH	G5	S5B,S2N	P		
COCCOTHRAUSTES VESPERTINUS EVENING GROSBEAK	G5	S5	P		
PASSER DOMESTICUS HOUSE SPARROW	G5	SE5	P		
MAMMALS:					
SOREX CINEREUS COMMON SHREW	G5	S5	NG		
SOREX MONTICOLUS DUSKY OR MONTANE SHREW	G5	S5	NG		
SOREX PALUSTRIS WATER SHREW	G5	S5	NG		
MYOTIS LUCIFUGUS LITTLE BROWN MYOTIS	G5	S5	NG		
MYOTIS EVOTIS LONG-EARED MYOTIS	G5	S4	NG		
MYOTIS THYSANODES FRINGED MYOTIS	G5	S3	NG		
MYOTIS VOLANS LONG-LEGGED MYOTIS	G5	S4	NG		
MYOTIS LEIBII EASTERN SMALL-FOOTED MYOTIS	G3	S?		C2	
MYOTIS CILIOLABRUM WESTERN SMALL-FOOTED MYOTIS	G5	S4	NG		
EPTESICUS FUSCUS BIG BROWN BAT	G5	S4	NG		
LASIURUS CINEREUS HOARY BAT	G5	S4	NG		
PLECOTUS TOWNSENDII TOWNSEND'S BIG-EARED BAT	G4	S2	NG		SENSITIVE
OCHOTONA PRINCEPS PIKA	G5	S5	NG		

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SYLVILAGUS NUTTALLII NUTTALL'S COTTONTAIL	G5	S4	NG		
LEPUS AMERICANUS SNOWSHOE HARE	G5	S5	NG		
LEPUS TOWNSENDII WHITE-TAILED JACKRABBIT	G4	S4	NG		
TAMIAS MINIMUS LEAST CHIPMUNK	G5	S5	NG		
TAMIAS AMOENUS YELLOW-PINE CHIPMUNK	G5	S5	NG		
TAMIAS RUFICAUDUS RED-TAILED CHIPMUNK	G5	S5	NG		
MARMOTA FLAVIVENTRIS YELLOW-BELLIED MARMOT	G5	S5	NG		
MARMOTA CALIGATA HOARY MARMOT	G5	S4	NG		
SPERMOPHILUS RICHARDSONII RICHARDSON'S GROUND SQUIRREL	G5	S5	NG		
SPERMOPHILUS COLUMBIANUS COLUMBIAN GROUND SQUIRREL	G5	S5	NG		
SPERMOPHILUS TRIDECEMLINEATUS THIRTEEN-LINED GROUND SQUIRREL	G5	S5	NG		
SPERMOPHILUS LATERALIS GOLDEN-MANTLED GROUND SQUIRREL	G5	S5	NG		
CYNOMYS LUDOVICIANUS BLACK-TAILED PRAIRIE DOG	G5	S4	NG		
TAMIASCIURUS HUDSONICUS RED SQUIRREL	G5	S5	NG		
GLAUCOMYS SABRINUS NORTHERN FLYING SQUIRREL	G5	S4	NG		
THOMOMYS TALPOIDES NORTHERN POCKET GOPHER	G5	S5	NG		
CASTOR CANADENSIS BEAVER	G5	S5	FB		
PEROMYSCUS MANICULATUS DEER MOUSE	G5	S5	NG		
ONYCHOMYS LEUCOGASTER NORTHERN GRASSHOPPER MOUSE	G5	S5	NG		
NEOTOMA CINEREA BUSHY-TAILED WOODRAT	G5	S5	NG		
CLETHRIONOMYS GAPPERI SOUTHERN RED-BACKED VOLE	G5	S5	NG		
PHENACOMYS INTERMEDIUS HEATHER VOLE	G5	S4	NG		
MICROTUS PENNSYLVANICUS MEADOW VOLE	G5	S5	NG		

MONTANA NATURAL HERITAGE PROGRAM
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Name Common Name	Global Rank	State Rank	State Status	USF&WS Status	USFS Status
MICROTUS MONTANUS MONTANE VOLE	G5	S5	NG		
MICROTUS LONGICAUDUS LONG-TAILED VOLE	G5	S5	NG		
MICROTUS RICHARDSONI WATER VOLE	G5	S4	NG		
LAGURUS CURTATUS SAGEBRUSH VOLE	G5	S4	NG		
ONDATRA ZIBETHICUS MUSKRAT	G5	S5	FB		
SYNAPTOMYS BOREALIS NORTHERN BOG LEMMING	G5	S2	NG		SENSITIVE
RATTUS NORVEGICUS NORWAY RAT	G5	SE	NG		
MUS MUSCULUS HOUSE MOUSE	G5	SE5	NG		
ZAPUS PRINCEPS WESTERN JUMPING MOUSE	G5	S5	NG		
ERETHIZON DORSATUM PORCUPINE	G5	S5	NG		
CANIS LATRANS COYOTE	G5	S5	U		
CANIS LUPUS GRAY WOLF	G4	S1	E	LELT	ENDANGERED
VULPES VULPES RED FOX	G5	S5	NG		
URSUS AMERICANUS BLACK BEAR	G5	S5	GA		
URSUS ARCTOS BROWN BEAR	G4	S3?	GARH	LENL	
PROCYON LOTOR RACCOON	G5	S5	NG		
MARTES AMERICANA MARTEN	G5	S4	FB		
MUSTELA ERMINEA ERMINE	G5	S5	FB		
MUSTELA NIVALIS LEAST WEASEL	G5	S4	U		
MUSTELA FRENATA LONG-TAILED WEASEL	G5	S5	U		
MUSTELA VISON MINK	G5	S5	FB		
GULO GULO WOLVERINE	G4	S4?	FBRH	C2	SENSITIVE
TAXIDEA TAXUS BADGER	G5	S4	NG		
MEPHITIS MEPHITIS STRIPED SKUNK	G5	S5	U		

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Name Common Name	Global Rank	State Rank	State Status	USF&WS Status	USFS Status
LUTRA CANADENSIS RIVER OTTER	G5	S4	FB		
FELIS CONCOLOR MOUNTAIN LION	G4	S4	GA		
FELIS LYNX LYNX	G5	S3	FBRH	C2	SENSITIVE
FELIS RUFUS BOBCAT	G5	S5	FB		
CERVUS ELAPHUS WAPITI OR ELK	G5	S5	GA		
ODOCOILEUS HEMIONUS MULE DEER	G5	S5	GA		
ODOCOILEUS VIRGINIANUS WHITE-TAILED DEER	G5	S5	GA		
ALCES ALCES MOOSE	G5	S5	GA		
ANTILOCAPRA AMERICANA PRONGHORN	G5	S5	GA		
OREAMNOS AMERICANUS MOUNTAIN GOAT	G5	S5	GA		
OVIS CANADENSIS BIGHORN SHEEP	G4	S4	GA		

408 Records Listed.

Appendix 5. Vertebrate Characterization Abstracts for the Sensitive Animal Species.

MONTANA NATURAL HERITAGE PROGRAM

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EXPLANATION OF VERTEBRATE CHARACTERIZATION ABSTRACT REPORTS

The Vertebrate Characterization Abstract (VCA), compiled by the Montana Natural Heritage Program, is a database containing records on 620 vertebrate species found in Montana. The VCA includes detailed information on attributes such as taxonomy, phenology, distribution, and habitat.

Each VCA consists of two portions: a global portion containing information applicable to the species throughout its range; and a state portion containing information specific to the species in Montana, such as location information.

The VCA database allows information to be sorted by shared characteristics such as location, habitat type, status, food habits, or activity patterns. Comment fields contain detailed information on migration, foods, reproduction and development, species ecology, activity, range, and habitat. Each record is also linked to fully-cited and abstracted reference sources.

EXPLANATION OF SPECIFIC FIELDS

Information in VCA reports is displayed using a combination of comments, codes and abbreviations. Although most of these entries are very straightforward, those which are abbreviated or coded are defined below. This guideline is arranged by the subheadings found in your report.

---Status---

Global rank and state rank:

Taxa are evaluated and ranked by the Heritage Program on the basis of their global (range-wide) status, and their state-wide status. These ranks are used to determine protection and data collection priorities, and are revised as new information becomes available.

A scale of 1 (critically imperiled) to 5 (demonstrably secure) is used for these ranks, and each species is assigned the appropriate combination of global and state ranks.

Example: common loon = G5 / S3 (i.e., species is demonstrably secure globally; in Montana is found within a restricted range).

Global and state ranks are assigned according to a standardized

procedure used by all Natural Heritage Programs, and are defined below.

Global/State Rank		Definition (G = Range-wide; S = Montana)
G1	S1	Critically imperiled because of extreme rarity (5 or fewer occurrences, or very few remaining individuals), or because of some factor of its biology making it especially vulnerable to extinction.
G2	S2	Imperiled because of rarity (6 to 20 occurrences), or because of other factors demonstrably making it very vulnerable to extinction throughout its range.
G3	S3	Either very rare and local throughout its range, or found locally (even abundantly at some of its locations) in a restricted range, or vulnerable to extinction throughout its range because of other factors; in the range of 21 to 100 occurrences.
G4	S4	Apparently secure, though it may be quite rare in parts of its range, especially at the periphery.
G5	S5	Demonstrably secure, though it may be quite rare in parts of its range, especially at the periphery.
GU	SU	Possibly in peril, but status uncertain; more information needed.
GH	SH	Historically known; may be rediscovered.
GX	SX	Believed to be extinct; historical records only, continue search.

Other codes:

A Accidental in the state; including species (usually birds or butterflies) recorded very infrequently, hundreds or thousands of miles outside their usual range.

B A state rank modifier indicating breeding status for a migratory species.

E An exotic established in the state; may be native in nearby regions.

N A state rank modifier indicating non-breeding status for a migratory species.

Q Taxonomic questions or problems involved, more information needed; appended to the global rank.

R Reported in the state; but lacking documentation which

would provide a basis for either accepting or rejecting the report.

T Rank for a subspecific taxon (subspecies or variety); appended to the global rank for the full species.

Z Ranking not applicable.

USF&WS (USESA) Status: The symbols in this column denote the categories defined in the U.S. Fish and Wildlife Service Notices of Review (1980, 1983, 1985, 1990), and indicate the status of a taxon with respect to the federal Endangered Species Act of 1973:

LE Endangered

LT Threatened

P Proposed E or T

C1 Notice of Review, Category 1 (substantial biological information on file to support the appropriateness of proposing to list as endangered or threatened).

C2 Notice of Review, Category 2 (current information indicates that proposing to list as endangered or threatened is possibly appropriate, but substantial biological information is not on file to support an immediate ruling).

C2* Category 2, and the taxon is possibly extinct.

3A Taxa for which the USFWS has persuasive evidence of extinction.

3B Names that, on the basis of current taxonomic understanding, do not represent taxa meeting the Endangered Species Act's definition of "species."

3C Taxa that have proven to be more abundant or widespread than was previously believed, and/or those that are not subject to any identifiable threat.

NL Not listed/no designation. (See note below.)

Note: A species can have more than one federal designation if the species' status varies within its range. In these instances the Montana designation is listed first.

Examples: bald eagle = LELT. Species is Listed Endangered in Montana; elsewhere in its range it may be Listed Threatened.

cutthroat trout = C2NL. Species is a Category 2 in Montana; elsewhere in its range it may not have USF&WS designation.

fisher = NLC2. Species has no USF&WS designation in Montana; elsewhere in its range it may be a Category 2.

USFS Region 1 Status: The status of species in Montana as defined by the U.S. Forest Service manual (2670.22). These taxa are listed as such by the Regional Forester (Northern Region) on Montana National Forests.

State Species Designations: These symbols give the state legal status of vertebrates as listed in the 1989 Statutes of Montana for the Department of Fish, Wildlife and Parks.

GA = game animal
GF = game fish
FB = fur bearing animal
MB = migratory bird
UB = upland game bird
E = endangered
NG = nongame wildlife
P = protected species
U = unprotected species

Management Status:

CD = closed season
RH = restricted harvest

The remaining Status indicators are checkoff fields. "Y" indicates the taxon is included in the status designation. Example: the bald eagle VCA would have "Y" after the state-protected non-game field.

---Distribution---

The occurrence status and migratory status of a taxon within specific counties, watersheds and ecoregions is tracked here.

The possible values for occurrence status are:

C = current
P = probable
X = extirpated
? = possible

The possible values for migratory status are:

SC = seasonal resident and confirmed breeder
SP = seasonal resident and probable breeder
S? = seasonal resident and possible breeder
SH = seasonal resident and current non-breeder, historic breeder
SN = seasonal resident and non-breeder
YC = year-round resident and confirmed breeder
YP = year-round resident and probable breeder
Y? = year-round resident and possible breeder
YH = year-round resident and current non-breeder, historic breeder
YN = year-round resident and non-breeder
T = transient

Watershed designations are based on the Hydrologic Unit Map for Montana, compiled and distributed by the U.S. Geological Survey.

Ecoregion designations are based on Bailey/Hammond Ecoregion and Land Surface Form maps. Ecoregion codes are:

2112M = cedar-hemlock-Douglas fir ecoregion; northern Rocky Mountain land surface form

3111L = grama-needlegrass-wheatgrass ecoregion; western north-central lake-swamp-morraine plains land surface form

3112L = wheatgrass-needlegrass ecoregion; upper Missouri basin broken lands land surface form

3112M = Douglas fir forest ecoregion; northern/middle Rocky Mountains land surface form

3151A = wheatgrass-needlegrass-sagebrush ecoregion; Wyoming Big Horn Basin land surface form.

---Migration---

"Y" after migration check-off fields indicates a taxon meets the stated condition.

---Habitat---

Appropriate habitat categories within seven major habitat types are listed.

---Phenology/Seasonality---

Presence or activity in the state is documented here by half-months. Codes used are:

P = present (resident or regular migrant)
A = present and active (e.g., not hibernating)
R = present, active, and reproducing

* * *

If you have questions about the Vetebrate Characterization Abstract, or about any of the other databases maintained by the Montana Natural Heritage Program, please contact us.

MONTANA NATURAL HERITAGE PROGRAM
State Library Building
1515 East Sixth Avenue
Helena, Montana 59620
(406) 444-3009

FELIS LYNX
LYNX

AUTHORITY: Kerr, 1792
HERITAGE REFERENCE: AMAJH03010

---TAXONOMY---
CLASS: MAMMALIA ORDER: CARNIVORA
FAMILY: FELIDAE GENUS: LYNX

TAXONOMIC COMMENTS: Placed in genus FELIS by some authors. Some authors regard L. LYNX, L. CANADENSIS, and L. PARDINUS as conspecific (see Tumlison 1987). Jones et al. (1992) treated L. CANADENSIS and L. LYNX as conspecific. Wozencraft (in Wilson and Reeder 1993) listed CANADENSIS, LYNX, and PARDINUS as separate species.

SUBSPECIES COMMENTS: F.L. CANADENSIS present in MT (Hall 1981); other specific names in use include LYNX LYNX and LYNX CANADENSIS.

---STATUS---
GLOBAL RANK: G5 USF&WS STATUS: C2NL
STATE RANK: S3 USFS REG. 1 STATUS: SENSITIVE

STATE SPECIES DESIGNATIONS:
GAME SPECIES: COMMERCIAL SPECIES:
SPORT FISH: FUR-BEARER: Y
PROTECTED NON-GAME: PEST:

GLOBAL STATUS COMMENTS:

STATE STATUS COMMENTS: Furbearer--harvest with permit, quota.

---DISTRIBUTION---
COUNTY DISTRIBUTION:

COUNTYNAME	OCCURRENCE STATUS	MIGRATORY STATUS
Beaverhead	P	YP
Blaine	P	YP
Flathead	P	YP
Gallatin	P	YP
Glacier	P	YP
Judith Basin	P	YP
Lewis and Clark	P	YP
Liberty	P	YP
Lincoln	P	YP
Madison	P	YP
Mineral	P	YP
Missoula	P	YP
Musselshell	P	YP
Park	P	YP
Pondera	P	YP
Ravalli	P	YP
Roosevelt	P	YP
Sanders	P	YP
Sweet Grass	P	YP
Teton	P	YP
Toole	P	YP
Wheatland	P	YP

ECOREGION DISTRIBUTION:

ECOREGION	OCCURRENCE STATUS	MIGRATORY STATUS
2112M	P	YP
3111L	P	YP
3112M	P	YP

WATERSHED DISTRIBUTION:

WATERSHED CODE	OCCURRENCE STATUS	MIGRATORY STATUS
100100	P	YP
100200	P	YP
100301	P	YP
100302	P	YP
100401	P	YP
100402	P	YP
100500	P	YP
100600	P	YP
100700	P	YP
170101	P	YP
170102	P	YP

MINIMUM ELEVATION: MAXIMUM ELEVATION:

GLOBAL RANGE COMMENTS: Throughout Alaska and Canada south through the Rocky Mountains, northern Great Lakes, and northern New England. Also northern Eurasia if regarded as conspecific with LYNX LYNX (=FELIS LYNX).

STATE RANGE COMMENTS: Resident in W MT (Thompson 1982). Appearances in E MT may be residents or movements from Canada--possibly a response to periodic shortages of snowshoe hares.

---MIGRATION---
NON-MIGRANT: Y
BREEDS IN STATE: Y
WINTERS IN STATE: Y
IRREGULAR APPEARANCE:
LOCAL MIGRANT:
DISTANT MIGRANT:
MIGRATORY TRANSIENT:
MIGRATION WITHIN STATE: Y

GLOBAL MIGRATION COMMENTS:

STATE MIGRATION COMMENTS: Non-migratory, but movements of 90-125 miles have been recorded between MT and Canada (Nash 1990). In other areas, long distance dispersal has been reported to range from 103-616 km (Saunders 1963, Nellis and Wetmore 1969, Brainerd 1985, Ward 1985, Brittell et al. 1989).

---HABITAT---
MARINE:

ESTUARINE:

RIVERINE:

LACUSTRINE:

PALUSTRINE: FORESTED WETLAND

TERRESTRIAL: FOREST
CONIFER
MIXED
ALPINE

SUBTERRAN:

GLOBAL SPECIAL FACTORS: STANDING SNAG/HOLLOW TREE

STATE SPECIAL FACTORS: Fallen log/debris
Old growth

GLOBAL HABITAT COMMENTS: Boreal forests with openings, regenerating mixed forest, rugged outcrops, bogs, and thickets. Will utilize tundra to forage for abundant prey. When inactive, occupies den typically in hollow tree, under stump, or in thick brush.

REPRODUCTIVE HABITAT COMMENTS: Young born in den (see above).

STATE HABITAT COMMENTS: In S. Fork Flathead lynx were mostly located in fire-created, densely stocked young stands of lodgepole pine where snowshoe hares were most abundant. No locations in open or semi-open areas (Koehler at al. 1979). In the Garnet Range most were found in subalpine fir forest (Smith 1984). Denning sites are found in mature and old growth lodgepole pine, spruce, and subalpine fir forests with a high density of logs (Koehler 1990, Koehler and Brittell 1990). Denning stands need not be large (1-3 ha) but several stands should be interconnected (Koehler and Brittell 1990). Lynx require cover for stalking and security, and usually do not cross openings wider than 100 m (Koehler and Brittell 1990).

---FOOD HABITS---
FOOD HABITS: CARNIVORE

GLOBAL FOOD COMMENTS: Eats primarily small mammals and birds, particularly LEPUS AMERICANUS. Occasionally feeds on squirrels, small mammals, beaver, deer, moose, muskrat, and birds; some taken as carrion. May cache food for later use.

STATE FOOD COMMENTS: Snowshoe hares are an important prey item, ranging from 43% of the diet during low snowshoe years to 100% during cyclic highs (Brand et al. 1976). High density lynx populations must be supported by snowshoe hares (Brand and Keith 1979). Barash (1971) observed cooperative hunting for ground squirrels; other prey items include mice, voles, squirrels, and grouse (McCord and Cardoza 1982, Hatler 1988).

---SPECIES ECOLOGY---
GLOBAL ECOLOGY COMMENTS: Home range increases and may become nomadic when prey is scarce (A85WAR01NA, A63SAV01NA, A80MEC01NA). Range of male (average often about 15-30 sq. km, but up to hundreds of sq. km in Alaska and Minnesota) larger than that of female. Population density usually less than 10 (locally up to 20) per 100 sq. km, depending on prey availability. Usually solitary.

STATE ECOLOGY COMMENTS: Home range sizes in North America are large, varying from 10 to 243 km2 (McCord and Cardoza 1982); typical home ranges are 16 to 20 km2 (Quinn and Parker 1987, Butts 1992). Home range sizes vary with sex, age, population density, prey density, and method of survey and calculation (McCord and Cardoza 1982, Ward and Krebs 1985, Quinn and Parker 1987, Hatler 1988). Some researchers have reported lynx maintain single sex territories (especially males) with male territories overlapping female territories (Mech 1980, Stephenson 1986, Koehler 1987). However, others found substantial overlap between territories of both the same and opposite sexed animals (Nellis et al. 1972, Brand et al. 1976, Carbyn and Patriquin 1983, Ward and Krebs 1985). Where lynx and bobcat are sympatric, home ranges overlap; however bobcats are at lower elevation in winter (Smith 1984).

---PHENOLOGY/SEASONALITY---
PHENOLOGY: NOCTURNAL
CREPUSCULAR

PRESENCE/ACTIVITY IN STATE:

month	first half	second half
JAN	A	A
FEB	R	R
MAR	R	R
APR	R	R
MAY	R	R
JUN	A	A
JUL	A	A
AUG	A	A
SEP	A	A
OCT	A	A
NOV	A	A
DEC	A	A

GLOBAL PHENOLOGY COMMENTS: Mainly nocturnal. Most active from 2 hours after sunset to one hour after sunrise (B74BAN01NA).

STATE PHENOLOGY COMMENTS:

---REPRODUCTION---
COLONIAL/AGGREGATE BREEDER:

GLOBAL REPRODUCTION COMMENTS: Breeds Mar.-May in Nearctic. Gestation 62-74 days. Litter size averages 3-4; 1 litter every 1-2 years. Young stay with mother until next mating season or longer. Some females give birth as yearling. Prey scarcity may suppress breeding.

STATE REPRODUCTION COMMENTS: Average 2.75 young/litter. Pregnancy rate of yearlings (44.4%) lower than adults (100%) (Brainerd 1985). In Alberta, reproduction fell 38% (ovulation rates, pregnancy rates & litter size) and mortality of kittens reached 95% during cyclic hare population lows (Brand and Keith 1979). Breeds in Feb or Mar. Gives birth in April or May. (Jones et al. 1983).

---MANAGEMENT---
GLOBAL MANAGEMENT COMMENTS: Trapping may be major source of mortality; refugia not subject to trapping may be important in maintaining populations during periods of low recruitment (A85WAR01NA). Population may increase even if trapping is main mortality source.

STATE MANAGEMENT COMMENTS: Lynx management should include 1) lynx habitat management; 2) snowshoe hare habitat management; and 3) lynx population management. Lynx habitat should include: 1) multiple mature/old growth forest patches for denning; and 2) avoiding opening the forest with clearcuts > 300 ft wide (Brittell et al. 1989, Koehler and Brittell 1990). Snowshoe hare habitat should include: 1) browse with tips <0.4" diameter and taller than snow depth; 2) dense security cover, especially conifers; 3) be well dispersed in time and location; 4) logging units 20-40 ac; and 5) maintain palatable forage during reforestation (Koehler 1990, Koehler and Brittell 1990). Lynx populations are cyclic, following their primary prey, the snowshoe hare. During low periods recruitment is low or non-existant; mortality is at those times additive rather than compensatory (Brittell et al. 1989). Harvesting during low population periods will decline further and recover slower than without harvest (Brand and Keith 1979). Overexploitation during low periods may jepardize populations in areas accessible to motor vehicles or snowmobiles (Brittell et al. 1989).

---ADDITIONAL ATTRIBUTES---
LENGTH (cm): 107 WEIGHT (g): 18100

---REFERENCES---

--SOURCECODE	--CITATION
A71BAR01MTUS	Barash, D. P. 1971. Cooperative hunting in the lynx. J. Mammal. 52:480.
U85BRA01MTUS	Brainerd, S. M. 1985. Reproductive ecology of bobcats and lynx in western Montana. M.S. thesis, University of Montana, Missoula, 85 pp.
A79BRA01MTUS	Brand, C. J., and L. B. Keith. 1979. Lynx demography during a snowshoe hare decline in Alberta. J. Wildl. Manage. 43:827-849.
U89BRI01MTUS	Brittell, J. D., R. J. Poelker, S. J. Sweeney, and G. M. Koehler. 1989. Native cats of Washington. Section III: Lynx. Unpubl. Rep. Wash. Dept. Wildl., Olympia. 169 pp.
U71BUR01MTUS	Burris, O. 1971. Lynx management in Alaska. Pp. 30-33 IN: S.E. Jorgenson and L.D. Mech (eds) Proceedings of the Symposium on Native Cats of North America. U.S. Fish and Wildl. Serv., Twin Cities, Minn. 139 pp.

U92BUT02MTUS Butts, T. W. 1992. Lynx (FELIS LYNX) biology and management: A literature review and annotated bibliography. USDA Forest Service, Northern Region Threatened, Endangered, and Sensitive Program, Missoula, MT. 114 pp. + appendix

A84FLA01MTUS Flath, D. L. 1984. Vertebrate species of special interest or concern. Mammals, birds, reptiles, amphibians, fishes. Spec. Publ. MT DFWP. Helena, 76 pp.

U90HASD1MTUS Hash, H. 1990. Montana lynx population status and considerations (1990). Unpubl. Rep. Mont. Dept. Fish, Wildl. Parks, Helena. 13 pp.

U88HAT01MTUS Hatler, D. F. 1988. A lynx management strategy for British Columbia. Ministry of Environment. 115 pp.

A69HOF01MTUS Hoffmann, R. S., P. L. Wright and F. E. Newby. 1969. Distribution of some mammals in Montana. I. Mammals other than bats. J. Mammal. 50(3): 579-604.

B83JON01MTUS Jones, J. K. Jr., D. M. Armstrong, R. S. Hoffmann and C. Jones. 1983. Mammals of the northern Great Plains. Univ. Neb. Press, Linclon. 379 pp.

U87KOE01MTUS Koehler, G. M. 1987. The ecology of the lynx (LYNX CANADENSIS) in northcentral Washington. Unpubl. Progress Report, Wildlife Research Institute, University of Idaho, Moscow. 25 pp.

A90KOE01MTUS Koehler, G. M. 1990. Population and habitat characteristics of lynx and snowshoe hares in north central Washington. Can. J. Zool. 68:845-851.

A90KOE02MTUS Koehler, G. M. 1990. Snowshoe hare, LEPUS AMERICANUS, use of forest successional stages and population changes during 1985-1989 in north-central Washington. Can. Field-Nat. 105:291-293.

A79KOE01MTUS Koehler, G. M., M. G. Hornocker and H. S. Hash. 1979. Lynx movements and habitat use in Montana. Can. Field Nat. 93:441-442.

A82MCC06MTUS McCord, C. M. and J. E. Cardoza. 1982. Bobcat and lynx. Pp. 728-766 In: J. A. Chapman and G. A. Feldhamer (eds). Wild mammals of North America: Biology, management and economics. Johns Hopkins University Press, Baltimore.

A69NEL01MTUS Nellis, C. H. and S. P. Wetmore. 1969. Long-range movements of lynx in alberta. J. Mammal. 50:640.

A72NEL01MTUS Nellis, C. H., S. P. Wetmore and L. B. Keith. 1972. Lynx-prey interactions in central Alberta. J. Wildlife Manage. 36:320-329.

A87QUI01MTUS Quinn, N. W. S. and G. Parker. 1987. Lynx. In: M. Novak, J. A. Baker, M. E. Obbard and B. Malloch (eds). Wild furbearer management and conservation in North America. Ministry of Nat. Resour., Ontario.

A63SAU01MTUS Saunders, J. K., Jr. 1963. Food habits of the lynx in Newfoundland. J. Wildl. Manage. 27:384-390.

A63SAU02MTUS Saunders, J. K., Jr. 1963. Movements and activities of the lynx in Newfoundland. J. Wildl. Manage. 27:390-400.

U84SMI01MTUS Smith, D. S. 1984. Habitat use, home range, and movements of bobcats in western Montana. M.S. Thesis, University of Montana, Missoula, 58 pp.

U86STE01MTUS Stephenson, R. O. 1986. Development of lynx population estimation techniques. Alaska Dept. Fish Game, Unpubl. Pittman-Robertson Prog. Rep. W-22-2,3,4, Job 7.12R, Juneau. 84 pp.

A86THO01MTUS Thompson, L. S. 1982. Distribution of Montana amphibians, reptiles, and mammals. Montana Audubon Council. 24 pp.

U85WAR01MTUS Ward, R. M. P. 1985. Behavioral responses of lynx to declining snowshoe hare abundance. M.S. Thesis, Univ. B.C., Vancouver. 106 pp.

A85WAR02MTUS Ward, R. M. P., and C. J. Krebs. 1985. Behavioral responses of lynx to declining snowshoe hare abundance. Can. J. Zool. 63:2817-2824.

A76BRA01NAUS Brand, C. J., L. B. Keith and C. A. Fischer. 1976. Lynx responses to changing showshoe hare densities in central Alberta. J. Wildl. Mgmt. 40(3):416-428.

A80MEC02NAUS Mech, L. D. 1980. Age, sex, reproduction, spatial organization of lynxes colonizing northeastern Minnesota. J. Mamm. 61(2):261-267.

A63SAV01NAUS Saunders, J. K. 1963. Movements and activities of the lynx in Newfoundland. J. Wildl. Mgmt. 27(3):390-400.

A71VAN01NAUS van Zyll de Jong. 1971. The status and management of the

Canada lynx in Canada. Proc. Sympos. Native Cats of North America. Their status and management. U.S. Sport Fisheries and Wildlife, Region 3, v+139 pp.

B74BAN01NAUS Banfield, A. W. F. 1974. The mammals of Canada. University of Toronto Press, Toronto.

A87QUI01NAUS Quinn, N. W. S. and J. E. Thompson. 1987. Dynamics of an exploited Canada lynx population in Ontario. J. Wildl. Manage. 51:297-305.

B77GOD01NAUS Godin, A. J. 1977. Wild mammals of New England. Johns Hopkins University Press, Baltimore. 304 pp.

A87TUM01NAUS Tumlison, R. 1987. Felis lynx. Mammalian Species 269:1-8.

B81HAL01NAUS Hall, E. R. 1981. The mammals of North America, 2nd edition, 2 vols., John Wiley and Sons, New York.

B83BAK01NAUS Baker, Rollin H. 1983. Michigan mammals. Michigan State University Press. 642 pp.

B79HAM01NAUS Hamilton, William J., Jr. and John O. Whitaker, Jr. 1979. Mammals of the eastern United States. Cornell University Press. Ithaca, NY. 346 pp.

B91KIT01NAUS Kitchener, A. 1991. The natural history of the wild cats. Comstock Publishing Associates, Cornell Univ. Press, Ithaca. xxi + 280 pp.

B93WIL01NAUS Wilson, D. E., and D. M. Reeder, editors. 1993. Mammal species of the world: a taxonomic and geographic reference. Second edition. Smithsonian Inst. Press, Washington. xviii + 1206 pp.

B92JON01NAUS Jones, J. K., Jr., et al. 1992. Revised checklist of North American mammals north of Mexico, 1991. Occas. Pap. Mus., Texas Tech Univ. (146):1-23.

SYNAPTOMYS BOREALIS
NORTHERN BOG LEMMING

AUTHORITY: (Richardson, 1828)
HERITAGE REFERENCE: AMAFF17020

---TAXONOMY---
CLASS: MAMMALIA ORDER: RODENTIA
FAMILY: MURIDAE GENUS: SYNAPTOMYS

TAXONOMIC COMMENTS: Included in the genus MICTOMYS by some paleontologists (e.g., Koenigswald and Martin 1984), but most authors have treated MICTOMYS as a subgenus of SYNAPTOMYS (Hall 1981; Jones et al. 1986, 1992; Musser and Carleton, in Wilson and Reeder 1993).

SUBSPECIES COMMENTS: S.b. chapmani (Hall 1981).

---STATUS---
GLOBAL RANK: G5 USF&WS STATUS:
STATE RANK: S2 USFS REG. 1 STATUS: SENSITIVE

STATE SPECIES DESIGNATIONS:
GAME SPECIES: COMMERCIAL SPECIES:
SPORT FISH: FUR-BEARER:
PROTECTED NON-GAME: Y PEST:

GLOBAL STATUS COMMENTS:

STATE STATUS COMMENTS: Rare. Very limited records or occurrence in Montana (Reichel and Beckstrom 1993).

---DISTRIBUTION---
COUNTY DISTRIBUTION:

COUNTYNAME	OCCURRENCE STATUS	MIGRATORY STATUS
Beaverhead	C	YC
Deer Lodge	P	
Flathead	C	YC
Glacier	?	
Granite	P	
Lake	P	
Lewis and Clark	?	
Lincoln	C	YC
Mineral	P	
Missoula	C	YC
Pondera	?	
Powell	?	
Ravalli	C	YC
Sanders	P	
Silver Bow	?	
Teton	?	

ECOREGION DISTRIBUTION:

ECOREGION	OCCURRENCE STATUS	MIGRATORY STATUS
2112M	C	YC
3112M	C	YC

WATERSHED DISTRIBUTION:

WATERSHED CODE	OCCURRENCE STATUS	MIGRATORY STATUS
100100	?	
100200	C	YC
100301	?	
100302	?	
170101	C	YC
170102	C	YC

MINIMUM ELEVATION: 1200 MAXIMUM ELEVATION: 2100

GLOBAL RANGE COMMENTS: Labrador west to central Alaska, south to Washington, southeastern Manitoba and northern New England (see A87CL003NA for recent records from Baxter State Park, Maine, and from Mt. Moosilauke, Grafton Co., New Hampshire).

STATE RANGE COMMENTS: Until recently there were few locations known in MT: several in Glacier National Park (Wright 1950, Weckworth and Hawley 1962) and one in the Rattlesnake drainage N of Missoula (Adelman 1979). During 1992, 5 additional sites were found, with locations ranging from the NW corner of MT to just N of Lost Trail Pass in Beaverhead Co. (Reichel and Beckstrom 1993). The northern bog lemming may eventually be found to occur locally across much of W MT.

---MIGRATION---

NON-MIGRANT: Y	LOCAL MIGRANT:
BREEDS IN STATE: Y	DISTANT MIGRANT:
WINTERS IN STATE: Y	MIGRATORY TRANSIENT:
IRREGULAR APPEARANCE:	MIGRATION WITHIN STATE:

GLOBAL MIGRATION COMMENTS:

STATE MIGRATION COMMENTS:

---HABITAT---

MARINE:

ESTUARINE:

RIVERINE:

LACUSTRINE:

PALUSTRINE: BOG/FEN

TERRESTRIAL: FOREST
CONIFER
MIXED
GRASSLAND/HERBACEOUS

SUBTERRAN:

GLOBAL SPECIAL FACTORS: FALLEN LOG/DEBRIS
BURROWING IN OR USING SOIL

STATE SPECIAL FACTORS:

GLOBAL HABITAT COMMENTS: Sphagnum bogs, wet meadows, moist mixed and coniferous forests; alpine sedge meadows, krummholz spruce-fir forest with dense herbaceous and mossy understory, mossy streamsides (AB7CL003NA). Occupies burrow systems up to 1 ft. deep and surface runways.

REPRODUCTIVE HABITAT COMMENTS: Young born in nest that may be underground or on the surface in concealing vegetation.

STATE HABITAT COMMENTS: All 5 sites found in 1992 contained thick mats of sphagnum moss (Reichel and Beckstrom 1992). Some of those sites contained an open overstory of subalpine fir and/or spruce; others lacked a tree component. Bog birch and/or a dwarf willow were present at all 5 sites. Previous habitat descriptions of S.B. CHAPMANI sites in the Northern Rocky Mountains have sometimes included mention of sphagnum moss (Layser and Burke 1973, Groves and Yensen 1989) while others have not (Wright 1950, Weckworth and Hawley 1962, Adelman 1979, Wilson et al. 1980). Wright (1950) captured lemmings in a swampy area containing spruce trees, timothy, alder and other moist site plants (Wright 1950). The Upper Rattlesnake Creek specimen was captured in a wet-sedge/bluejoint meadow near subalpine fir (Adelman 1979).

---FOOD HABITS---
FOOD HABITS: HERBIVORE

GLOBAL FOOD COMMENTS: Feeds on grass and other herbaceous vegetation.

STATE FOOD COMMENTS: In Canada, it feeds on grasses and sedges, cut into short sections & piled along runways (Banfield 1974).

---SPECIES ECOLOGY---
GLOBAL ECOLOGY COMMENTS: Probably maintains a home range of less than 1 acre. Population densities may range up to 3 dozen per acre. Very sociable; may be found in small colonies.

STATE ECOLOGY COMMENTS: Very little known about this species; it is one of the poorest studied small mammals in North America. Not the same species as the lemming famous for explosive populations & purported migrations in the far north (LEMMUS SIBIRICUS).

---PHENOLOGY/SEASONALITY---
PHENOLOGY: CIRCADIAN

PRESENCE/ACTIVITY IN STATE:

month	first half	second half
JAN	A	A
FEB	A	A
MAR	A	A
APR	A	A
MAY	R	R
JUN	R	R
JUL	R	R
AUG	R	R
SEP	A	A
OCT	A	A
NOV	A	A
DEC	A	A

GLOBAL PHENOLOGY COMMENTS: Active day/night throughout the year.

STATE PHENOLOGY COMMENTS: Active both day and night (Reichel and Beckstrom 1993).

---REPRODUCTION---
COLONIAL/AGGREGATE BREEDER:

GLOBAL REPRODUCTION COMMENTS: Breeds May-August. Gestation probably 3 weeks. Litter size 2-8 (average 4). Several litters per year.

STATE REPRODUCTION COMMENTS: Little information available. At least some individuals may breed the same summer they are born. One litter from MT was 3.

---MANAGEMENT---
GLOBAL MANAGEMENT COMMENTS:

STATE MANAGEMENT COMMENTS: Based on limited information about northern bog lemmings, we feel the minimum necessary management recommendations are as follows. 1) Maintain a 100 m buffer for management activities around riparian areas/corridors where sphagnum mats are found. 2) Minimize domestic livestock grazing in drainages with sphagnum mats present. Range conditions in these riparian areas should be maintained in good to excellent categories. If current range condition is fair or poor, stocking rates should be reduced to a point where rapid recovery occurs. 3) Avoid human activities which will alter streamflow in drainages with sphagnum mats present. 4) Assume northern bog lemmings are present during land use planning processes on western Montana lands. Additional research is needed and may show other management actions will be necessary for maintenance of viable northern bog lemming populations.

---ADDITIONAL ATTRIBUTES---
LENGTH (cm): 14 WEIGHT (g): 34

---REFERENCES---

--SOURCECODE	--CITATION
U79ADE01MTUS	Adelman, E. B. 1979. A survey of the nongame mammals in the Upper Rattlesnake Creek drainage of western Montana. (M.S. Thesis) University of Montana, Missoula. 129pp.
B74BAN01MTUS	Banfield, A. W. F. 1974. The mammals of Canada. University of Toronto Press, Toronto. Reprinted, 1981.
A87CLO01MTUS	Clough, G. C., and J. J. Albright. 1987. Occurrence of the northern bog lemming, SYNAPTOMYS BOREALIS, in the northeastern United States. Can. Field-Naturalist 101:611-613.
A89GRO01MTUS	Groves, C. and E. Yensen. 1989. Rediscovery of the northern bog lemming (SYNAPTOMYS BOREALIS) in Idaho. Northw. Nat. 70:14-15.
A27HOW01MTUS	Howell, A. B. 1927. Revision of the American lemming mice (genus SYNAPTOMYS). N. Amer. Fauna 50. 37 pp.
A73LAY01MTUS	Layser, E. F. and T. E. Burke. 1973. The northern bog lemming and its unique habitat in northeastern Washington. Murrelet 54:7-8.
A99PRE01MTUS	Preble, E. A. 1899. Description of a new lemming mouse from the White Mountains, New Hampshire. Proc. Biol. Soc. Wash. 13:43-45.
U93REI01MTUS	Reichel, J. D. and S. G. Beckstrom. 1993. Northern bog lemming survey: 1992. (Unpublished report) Montana Natural Heritage Program. Helena, MT. 64 pp.
A62WEC01MTUS	Weckworth, R. P. and V. D. Hawley. 1962. Marten food habits and population fluctuations in Montana. J. Wildl. Manage. 26(1):55-74.
A80WIL02MTUS	Wilson, C., R. E. Johnson, and J. D. Reichel. 1980. New records for the northern bog lemming in Washington. Murrelet 61:104-106.
A50WRI01MTUS	Wright, P. L. 1950. SYNAPTOMYS BOREALIS from Glacier National Park, Montana. J. Mammal. 31(4):460.
B84KOE01NAUS	Koenigswald, W. von and L. D. Martin. 1984. Revision of the fossil and Recent Lemminae (Rodentia, Mammalia). Spec. Publ. Carnegie Mus. Nat. Hist. 9:122-137.
B86JON01NAUS	Jones, J. K., Jr., D. C. Carter, H. H. Genoways, R. S. Hoffman, D. W. Rice and C. Jones. 1986. Revised checklistof North American mammals north of Mexico, 1986. Occas. Papers Mus., Texas Tech Univ. 107:1-22.
B81HAL01NAUS	Hall, E. R. 1981. The mammals of North America, 2nd edition, 2 vols., John Wiley and Sons, New York.
B77GOD01NAUS	Godin, A. J. 1977. Wild mammals of New England. Johns Hopkins University Press, Baltimore. 304 pp.
B27HOW01NAUS	Howell, A. H. 1927. Revision of the American lemming mice (genus Synaptomys). North American Fauna 50:1-38.
B79HAM01NAUS	Hamilton, William J., Jr. and John O. Whitaker, Jr. 1979. Mammals of the eastern United States. Cornell University Press. Ithaca, NY. 346 pp.
B74BAN01NAUS	Banfield, A. W. F. 1974. The mammals of Canada. University of Toronto Press, Toronto.
A99PRE01NAUS	Preble, E. A. 1899. Description of a new lemming mouse from the White Mountains, NH. Proc. Biological Soc. Wash. 13:43-45.
A87CLO03NAUS	Clough, G. C., and J. J. Albright. 1987. Occurrence of the northern bog lemming, SYNAPTOMYS BOREALIS, in the northeastern United States. Canadian Field-Nat. 101:611-613.
B92JON01NAUS	Jones, J. K., Jr., et al. 1992. Revised checklist of North American mammals north of Mexico, 1991. Occas. Pap. Mus., Texas Tech Univ. (146):1-23.
B93WIL01NAUS	Wilson, D. E., and D. M. Reeder, editors. 1993. Mammal species of the world: a taxonomic and geographic reference. Second edition. Smithsonian Inst. Press, Washington. xviii + 1206 pp.

PLECOTUS TOWNSENDII
TOWNSEND'S BIG-EARED BAT

AUTHORITY: Cooper, 1837
HERITAGE REFERENCE: AMACC08010

---TAXONOMY---
CLASS: MAMMALIA ORDER: CHIROPTERA
FAMILY: VESPERTILIONIDAE GENUS: PLECOTUS

TAXONOMIC COMMENTS: Formerly known as CORYNORHINUS RAFINESQUII. Placed in the genus PLECOTUS by Handley (1959). Frost and Timm (1992) evaluated morphological and karyological characters from a phylogenetic perspective; they re-elevated the subgenus CORYNORHINUS to full genus status--the North America species PLECOTUS MEXICANUS, P. RAFINESQUII, and P. TOWNSENDII were moved from the genus PLECOTUS and once again placed in the genus CORYNORHINUS, leaving the Old World species PLECOTUS AURITUS, P. AUSTRIACUS, and P. TENERIFFAE as the only members of the genus PLECOTUS. A morphological phylogenetic analysis by Tumlison and Douglas (1992) also concluded that MEXICANUS, RAFINESQUII, and TOWNSENDII should be placed in the genus CORYNORHINUS.

SUBSPECIES COMMENTS:

---STATUS---
GLOBAL RANK: G4 USF&WS STATUS:
STATE RANK: S2 USFS REG. 1 STATUS: SENSITIVE

STATE SPECIES DESIGNATIONS:
GAME SPECIES: COMMERCIAL SPECIES:
SPORT FISH: FUR-BEARER:
PROTECTED NON-GAME: PEST:

GLOBAL STATUS COMMENTS: Fairly common in the West, but two eastern subspecies (Ozark big-eared bat, PLECOTUS TOWNSENDII INGENS of Missouri, Oklahoma, and Arkansas; and Virginia big-eared bat, P. T. VIRGINIANUS of Kentucky, West Virginia, and Virginia) are listed by USFWS as Endangered (44 FR 69208, 30 November 1979) (see VCAGs and EGRs for subspecies).

STATE STATUS COMMENTS: Secure roosting habitat is probably the limiting factor for PLECOTIS in MT. Threats to this habitat includes reclamation of abandoned mines, cave/mine exploration and vandalism, and seismic activity and road building (Twente 1955, Humphrey and Kunz 1976, Genter 1989, Madsen et al. 1993).

---DISTRIBUTION---
COUNTY DISTRIBUTION:

COUNTYNAME	OCCURRENCE STATUS	MIGRATORY STATUS
Beaverhead	C	Y?
Big Horn	C	Y?
Carbon	P	Y?
Carter	P	Y?
Chouteau	P	Y?
Fergus	P	Y?
Flathead	P	Y?
Jefferson	P	Y?
Lake	C	Y?
Madison	P	YP
Mineral	P	Y?
Missoula	P	Y?
Musselshell	P	Y?
Powder River	P	YC
Ravalli	P	YP
Richland	P	Y?
Sanders	P	Y?
Yellowstone	P	Y?

ECOREGION DISTRIBUTION:

ECOREGION	OCCURRENCE STATUS	MIGRATORY STATUS
2112M	P	YP
3111L	P	YP
3112L	P	YP
3112M	P	YP
3151A	P	YP

WATERSHED DISTRIBUTION:

WATERSHED CODE	OCCURRENCE STATUS	MIGRATORY STATUS
100301	P	YP
100302	P	YP
100401	P	YP
100402	P	YP
100600	P	YP
100800	P	YP
100901	P	YP
101000	P	YP
101102	P	YP
101202	P	YP
170102	P	YP
10020001	P	YP
10020007	P	YP
10070004	P	YP
10090207	P	YP
17010205	P	YP
17010208	P	YP
17010212	P	YP
17010213	P	YP

MINIMUM ELEVATION: MAXIMUM ELEVATION:

GLOBAL RANGE COMMENTS: Found throughout western North America from British Columbia south to the Isthmus of Tehuantepec, south and eastward to the Black Hills of South Dakota, across western Texas, eastward to the Edwards Plateau. Isolated populations exist in the gypsum caves of northeastern Texas, Oklahoma, and Kansas, and in limestone regions of Arkansas, Missouri, Illinois, Indiana, Ohio, Kentucky, Virginia, and West Virginia. From near sea level to well above 3160 m in some areas.

STATE RANGE COMMENTS: Scattered records imply that this species has a statewide distribution (Thompson 1982). Only two confirmed breeding colonies; several confirmed hibernacula.

---MIGRATION---

NON-MIGRANT: Y
BREEDS IN STATE: Y
WINTERS IN STATE: Y
IRREGULAR APPEARANCE:
LOCAL MIGRANT:
DISTANT MIGRANT:
MIGRATORY TRANSIENT:
MIGRATION WITHIN STATE: Y

GLOBAL MIGRATION COMMENTS: Relatively sedentary; the longest documented movements are on the order of 32-64 km. Apparently a local migrant in Arizona; summers throughout the state but known mainly from south of the Mogollon Plateau and northwest Mohave County in winter (Hoffmeister 1986).

STATE MIGRATION COMMENTS: No available information.

---HABITAT---

MARINE:

ESTUARINE:

RIVERINE:

LACUSTRINE:

PALUSTRINE:

TERRESTRIAL: FOREST
WOODLAND
HARDWOOD
CONIFER
MIXED
DESERT

SUBTERRAN: SUBTERRESTRIAL

GLOBAL SPECIAL FACTORS:

STATE SPECIAL FACTORS: Cave

GLOBAL HABITAT COMMENTS: Maternity and hibernation colonies typically are in caves and mine tunnels. Prefers relatively cold places for hibernation, often near entrances and in well-ventilated areas. In California, most limestone caves are too warm for successful hibernation; solitary males and small groups of females are known to hibernate in buildings in the central part of the state. Does not use crevices or cracks; hangs from the ceiling, generally near the zone of total darkness (Schmidly 1991). Uses caves, buildings and tree cavities for night roosts. Throughout much of the known range, commonly occurs in mesic habitats characterized by coniferous and deciduous forests (Kunz and Martin 1982), but occupies a broad range of habitats (e.g., see Handley 1959). In California and Washington, known from limestone caves, lava tubes, and human-made structures in coastal lowlands, cultivated valleys, and nearby hills covered with mixed vegetation. On West Coast found regularly in forested regions and buildings, and in areas with a mosaic of woodland, grassland, and/or shrubland. Recorded from pine-fir-hemlock-broadleaf deciduous forest in western Oregon, and from the edge of spruce-fir forest in Colorado (see Handley 1959). In Texas, ranges from desert scrub to pinyon-juniper woodland, consistently in areas with canyons or cliffs (Schmidly 1991). In New Mexico, most commonly captured in evergreen forests during warm months, least commonly captured in xeric shrublands (see Kunz and Martin 1982). In Arizona, occurs in desertscrub, in shelters in desert mountains (where infrequent), oak woodland, pinyon-juniper, and conifer forests (Hoffmeister 1986). Apparently restricted in Kansas and Oklahoma to riparian communities and nearby gypsum caves in the mid-grass prairie region. Generally uncommon in prairies and extreme desert, although occurs in the lower elevations of the arid plateau and desert ranges of northcentral Mexico and the arid valleys south of the transverse volcanic belt. Known in Mexico mostly from relatively arid regions (e.g., grassy hills with nearby pine-oak woodland) but also from more humid localities with oak, pine, juniper, cypress, madrone, and manzanita (Handley 1959). Ozark and Appalachian populations inhabit caves mostly in oak-hickory forest (Handley 1959). Nimble; able to fly through narrow passages (Hoffmeister 1986).

REPRODUCTIVE HABITAT COMMENTS: Females gather in small nursery colonies in the warm parts of caves or mines, sometimes in buildings (western U.S.). Individuals generally return to the same maternity roost in successive years.

STATE HABITAT COMMENTS: Generally found in low densities, occupying a range of habitats including moist forests (Thomas and West 1991) as well as arid regions (Genter and Metzgar 1985). In W MT they are most closely associated with cavernous habitat and rocky outcrops of sedimentary or limestone origin, which are used for roosting. In old growth forests, large diameter hollow trees may be used for roosting. Occasionally, individuals may be found in buildings. Maternity colonies are found in warm areas of caves, mines and occasionally buildings (Pearson et al. 1952, Genter, pers. obs.). Hibernacula are typically in caves or mines with winter temperatures 2-7 deg. C and relative humidity >50%.

---FOOD HABITS---
FOOD HABITS: INVERTIVORE

GLOBAL FOOD COMMENTS: Feeds on various flying insects near the foliage of trees and shrubs. May feed primarily on moths (Barbour and Davis 1969).

STATE FOOD COMMENTS: No available information for MT. In W Oregon, stomachs from 16 bats contained 95% Lepidoptera (Whitaker et al. 1977).

---SPECIES ECOLOGY---
GLOBAL ECOLOGY COMMENTS: Crude population density in Oklahoma was estimated at one bat per 46.6 sq km (see Kunz and Martin 1982), about 3-4 times greater than that reported for populations in California (Pearson et al. 1952). Hibernates singly, or in clusters in some areas (Caire et al. 1989, Schmidly 1991). Tends not to associate in daytime and hibernation roosts with other species of bats, though scattered individuals of other normally colonial species occasionally may be present (Handley 1959). Pre-weaning post-natal mortality generally is low. Adult survivorship is relatively high (about 70-80% in females in California). Predation has been suggested as the primary limiting factor in Kansas and Oklahoma (see Handley 1959). Pearson et al. (1952) believed that a population increase might be dependent on the establishment of new nursery colonies (colonies remained static in size year after year); how new nursery colonies become established is not known (Handley 1959).

STATE ECOLOGY COMMENTS: Females form maternity colonies during the spring and summer. Colonies are typically composed of 20-180 females, each giving birth to one pup after a gestation period of 55-100 days (Pearson et al. 1952, Genter pers. obs.). Pups are able to fly in 3 weeks and are weaned at 6 weeks. Both sexes congregate at cooler caverns in late summer/early fall (called swarming sites).

---PHENOLOGY/SEASONALITY---
PHENOLOGY: HIBERNATES/AESTIVATES
NOCTURNAL

PRESENCE/ACTIVITY IN STATE:

month	first half	second half
JAN	P	P
FEB	P	P
MAR	P	P
APR	A	A
MAY	R	R
JUN	R	R
JUL	R	R
AUG	R	A
SEP	A	R
OCT	R	R
NOV	P	P
DEC	P	P

GLOBAL PHENOLOGY COMMENTS: Activity usually begins well into the night, late relative to other bats, though activity prior to darkness has been observed in some areas. In late afternoon or evening, prior to emergence, may move closer to cave entrance. After an initial feeding period, roosts and rests during the night, presumably before a later feeding bout. Commonly arouses in winter, changing position within a hibernaculum or moving to a nearby cave or mine.

STATE PHENOLOGY COMMENTS: P. TOWNSENDII hibernates in in caves and mines beginning in October (depending on elevation and local weather). They begin to be active in March or April. Females gather in maternity colonies and give birth May - June. Males are found in a wide variety of locations at this time, often singly or in small groups (Hoffmann and Pattie 1968). Pups are weaned in July - early August, and maternity roosts begin to break up in late Aug - Sept. Both sexes gather in cooler swarming caves/mines at this time. Copulation occurs in late Sept. and October. Hibernation begins in Oct.

---REPRODUCTION---
COLONIAL/AGGREGATE BREEDER: Y

GLOBAL REPRODUCTION COMMENTS: Mating begins in autumn, continues into winter. Ovulation and fertilization are delayed until late winter/early spring. Gestation 2-3.5 months. Litter of 1 is born in late spring/early summer (beginning mainly in late May in California, the second week of July in Washington, and June in southwestern Texas). Throughout the U.S. range, the earliest births occur in mid-April, the latest in late July (see Handley 1959). Young can fly at 2.5-3 weeks, weaned by 6 weeks. Females are sexually mature their first summer. Males are not sexually active until their second year (California). Young fly at 1 month of age, weaned at 2 months. Nearly all adult females breed every year. Females commonly form nursery colonies generally of up to about 200 (west) or 1000 (east), but solitary pregnant females are frequently encountered (Handley 1959); males roost separately (apparently solitary) during this time.

STATE REPRODUCTION COMMENTS: The major known maternity colony in MT is located in Lewis and Clark Carverns. This cavern system is also used for hibernation. A nursery colony was located in Lake County in 1992.

---MANAGEMENT---
GLOBAL MANAGEMENT COMMENTS: See White and Seginak (1987) for gate designs for protecting caves. See Bagley (1984) for recovery plan. Very susceptible to disturbance; may permanently abandon hibernating sites and roosts if disturbed. Relatively difficult to capture in mist nests (Handley 1959).

STATE MANAGEMENT COMMENTS: The following management strategies may to used to protect/enhance PLECOTUS TOWNSENDII habitat and populations. 1) Maternity roosts and hibernacula should be protected and managed as critical habitat. Seasonal restrictions should be placed on entry from May to mid-Sept in maternity roosts, and Oct to Apr for hibernacula. 2) Caves or abandoned mines with known bat use should be evaluated for gate installation. Likewise, roads which access such caves should be closed where feasible. 3) Areas surrounding caverns, rockfaces, or other known roosts should retain their canopy cover. Heavy equipment and blasting should not be permitted near roosts. 4) Survey existing caves and mines for bat use. This is critical for active management activities such as logging and mine closures. 5) Retain large diameter snags and stands of old growth for maintenance of roosting habitat. 6) Limit chemical insect control.

---ADDITIONAL ATTRIBUTES---
LENGTH (cm): 11 WEIGHT (g): 12

---REFERENCES---

--SOURCECODE	--CITATION
A84FLA01MTUS	Flath, D. L. 1984. Vertebrate species of special interest or concern. Mammals, birds, reptiles, amphibians, fishes. Spec. Publ. MT DFWP. Helena, 76 pp.
A86GEN01MTUS	Genter, D. L. 1986. Wintering bats of the upper Snake River plain: occurrence in lava-tube caves. Great Basin Naturalist 46(2):241-244.
N89GEN01MTUS	Genter, D. L. 1989. Townsend's big-eared bat, PLECOTUS TOWNSENDII. In: T. W. Clark, A. H. Harvey, R. D. Dorn, D. L. Genter, and C. Groves (eds). Rare, sensitive, and threatened species of the Greater Yellowstone ecosystem. N. Rockies Conserv. Coop., Mont. Natural Heritage Program, The Nature Conservancy, and Mountain W. Envir. Serv. 153 pp.
N85GEN01MTUS	Genter, D. L. and L. H. Metzgar. 1985. Survey of the bat species and their habitat use in Grand Teton National Park. Pp. 65-69. In: Univ. Wyo.-Natl. Park Serv. Res. Center, Ann. Report 9.
A69HOF02MTUS	Hoffmann, R. S., D. L. Pattie and J. F. Bell. 1969. The distribution of some mammals in Montana. II. Bats. J. Mamal. 50(4):737-741.
B68HOF01MTUS	Hoffmann, R. S. and D. L. Pattie. 1968. A guide to Montana mammals: identification, habitat, distribution and abundance. Univ. Montana Printing Serv. 133 pp.
A76HUM01MTUS	Humphrey, S. R. and T. H. Kunz. 1976. Ecology of a Pleistocene relict, the western big-eared Bat (PLECOTUS TOWNSENDII)in the southern Great Plains. Journal of Mammalogy 57(3):470-494.
U93MAD01MTUS	
A81MAS01MTUS	Maser, C., et al. 1981. Natural history of Oregon coast animals. USDA-USFS, USDI-BLM, General Technical Report PNW-133.
A79SWE01MTUS	Swenson, J. E. and G. F. Shanks, Jr. 1979. Noteworthy records of bats from northeastern Montana. J. Mammal. 60:650-652.
N89THO01MTUS	Thomas, D. W., and S. D. West. 1989. Sampling methods for bats. U.S.D.A. Forest Serv. Pac. Northw. Res. Station Gen. tech. Report PNW-GTR-243. 20 pp.
A91THO01MTUS	Thomas, D. W., and S. D. West. 1991. Forest age associations of bats in the southern Washington Cascade and Oregon Coast Ranges. Pp. 295-303. IN: Ruggiero, L. F., K. B. Aubry, A. B. Carey, and M. H. Huff (tech. coord.). Wildlife and vegetation of unmanaged Douglas-fir forests. U.S.D.A. Forest Serv., Pac. Northw. Res. Station, Gen. Tech. Report PNW-GTR-285. 533 pp.
A82THO02MTUS	Thompson, L. S. 1982. Distribution of Montana amphibians, reptiles, and mammals. Montana Audubon Council. 24 pp.
A55TWE01MTUS	Twente, J. W., Jr. 1955. Some aspects of habitat selection and other behavior of cavern-dwelling bats. Ecology 36(4): 706-732.
B85VAN01MTUS	van Zyll de Jong, C. G. 1985. Handbook of Canadian mammals, 2 bats. National Museums of Canada, Ottawa.
A77WHI01MTUS	Whittaker, J. O., Jr., C. Maser, and L. E. Keller. 1977. Food habits of bats of western Oregon. Northw. Sci. 51:46-55.
B79HAM01NAUS	Hamilton, William J., Jr. and John O. Whitaker, Jr. 1979. Mammals of the eastern United States. Cornell University Press. Ithaca, NY. 346 pp.
B81SCH01NAUS	Schwartz, Charles W. and Elizabeth R. Schwartz. THE WILD MAMMALS OF MISSOURI, REVISED ED. 1981. U. OF MISSOURI PRESS AND DEPT OF CONSERVATION. COLUMBIA AND LONDON. 356 PP.
A87WHI01NAUS	White, D. H., and J. T. Seginak. 1987. Cave gate designs for use in protecting endangered bats. Wildl. Soc. Bull. 15:445-449.
A82KUN02NAUS	Kunz, T. H. and R. A. Martin. 1982. PLECOTUS TOWNSENDII. Am. Soc. Mamm., Mammalian Species No. 175. 6 pp.
B69BAR01NAUS	Barbour, R. W. and W. H. Davis. 1969. Bats of America. The University of Kentucky Press, Lexington.
B84BAG01NAUS	Bagley, F. M. 1984. Recovery plan for the Ozark big-eared bat and the Virginia big-eared bat. U.S. Fish & Wildl. Serv. 119 pp.

A85BAG01NAUS Bagley, R. and J. Jacobs. 1985. Census techniques for endangered big-eared bats proving successful. Endang. Spec. Tech. Bull. 10(3):5-7.

A52PEA01NAUS Pearson, O. P., M. R. Koford and A. K. Pearson. 1952. Reproduction of the lump-nosed bat (CORYNORHINUS RAFINESQUII) in California. J. Mamm. 33:273-320.

B85VAN01NAUS van Zyll de Jong, C.G. 1985. Handbook of Canadian mammals. Vol 2. Bats. National Museums of Canada, Ottawa. 212 pp.

B89CAI01NAUS Caire, W., et al. 1989. Mammals of Oklahoma. Univ. Oklahoma Press, Norman. 567 pp.

A59HAN02NAUS Handley, C. O., Jr. 1959. A revision of American bats of the genera Euderma and Plecotus. Proc. U.S. Natl. Mus. 110:95-246.

B91SCH02NAUS Schmidly, D. J. 1991. The bats of Texas. Texas A & M Univ. Press, College Station. 188 pp.

B81HAL01NAUS Hall, E. R. 1981. The mammals of North America, 2nd edition, 2 vols., John Wiley and Sons, New York.

B65ING01NAUS Ingles, L. G. 1965. Mammals of the Pacific States. Stanford University Press, Stanford.

A77JON02NAUS Jones, C. 1977. Plecotus rafinesquii. American Soc. Mamm., Mammalian Species No. 69. 4 pp.

B92FRO01NAUS Frost, D. R. and R. M. Timm. 1992. Phylogeny of plecotine bats (CHIROPTERA: "VESPERTILIONIDAE"): proposal of a logically consistent taxonomy. Am. Mus. Novitates 3034:1-16.

A92TUM01NAUS Tumlison, R., and M. E. Douglas. 1992. Parsimony analysis and the phylogeny of the plecotine bats (Chiroptera: Vespertilionidae). J. Mamm. 73:276-285.

PICOIDES ARCTICUS
BLACK-BACKED WOODPECKER

AUTHORITY: (Swainson, 1832)
HERITAGE REFERENCE: ABNYF07090

---TAXONOMY---
CLASS: AVES ORDER: PICIFORMES
FAMILY: PICIDAE GENUS: PICOIDES

TAXONOMIC COMMENTS:

SUBSPECIES COMMENTS: None (Committee on Classification and Nomenclature 1957).

---STATUS---
GLOBAL RANK: G5 USF&WS STATUS:
STATE RANK: S3 USFS REG. 1 STATUS: SENSITIVE

STATE SPECIES DESIGNATIONS:
GAME SPECIES: COMMERCIAL SPECIES:
SPORT FISH: FUR-BEARER:
PROTECTED NON-GAME: Y PEST:

GLOBAL STATUS COMMENTS:

STATE STATUS COMMENTS:

---DISTRIBUTION---
COUNTY DISTRIBUTION:

COUNTYNAME	OCCURRENCE STATUS	MIGRATORY STATUS
Beaverhead	?	T
Big Horn	P	SP
Broadwater	P	T
Cascade	P	YP
Custer	P	SN
Deer Lodge	P	SP
Flathead	C	YC
Gallatin	P	SN
Glacier	P	YP
Granite	P	T
Jefferson	?	S?
Lake	?	T
Lewis and Clark	P	T
Lincoln	P	T
Madison	P	YP
Meagher	P	YP
Mineral	P	YP
Missoula	P	SN
Park	P	YP
Pondera	P	YP
Powder River	P	T
Powell	P	SP
Ravalli	C	YP
Rosebud	P	SN
Sanders	C	YC
Silver Bow	P	T
Stillwater	C	YP
Sweet Grass	P	SP
Teton	P	SP
Treasure	P	T

ECOREGION DISTRIBUTION:

ECOREGION	OCCURRENCE STATUS	MIGRATORY STATUS
2112M	P	YP
3111L	P	YP
3112L	P	YP
3112M	P	T

WATERSHED DISTRIBUTION:

WATERSHED CODE	OCCURRENCE STATUS	MIGRATORY STATUS
100100	P	T
100200	P	T
100301	P	YP
100302	P	YP
100500	P	T
100700	P	YP
100901	P	SP
100902	P	T
101000	P	YP
170101	C	YC
170102	P	SP

MINIMUM ELEVATION: MAXIMUM ELEVATION:

GLOBAL RANGE COMMENTS: Resident, often locally, from w. and cen. AK to n. Sask. and cen. Labrador, south to se. Brit. Col., cen. CA, nw. WY, sw. SD, cen. Sask., n. MN, se. Ontario, and n. New England. Wanders irregularly south in winter.

STATE RANGE COMMENTS: Breeds in montane areas of W MT. Winter range may be more restricted to NW MT (Bergeron et al. 1992).

---MIGRATION---

NON-MIGRANT: Y
BREEDS IN STATE: Y
WINTERS IN STATE: Y
IRREGULAR APPEARANCE:
LOCAL MIGRANT:
DISTANT MIGRANT:
MIGRATORY TRANSIENT:
MIGRATION WITHIN STATE:

GLOBAL MIGRATION COMMENTS:

STATE MIGRATION COMMENTS:

---HABITAT---

MARINE:

ESTUARINE:

RIVERINE:

LACUSTRINE:

PALUSTRINE: FORESTED WETLAND
RIPARIAN

TERRESTRIAL: FOREST
CONIFER
MIXED

SUBTERRAN:

GLOBAL SPECIAL FACTORS: STANDING SNAG/HOLLOW TREE

STATE SPECIAL FACTORS: Old growth

GLOBAL HABITAT COMMENTS: Coniferous forest (primarily spruce and fir), especially windfalls and burned areas with standing dead trees; less frequently in mixed forest, rarely in winter in deciduous woodland (B83COM01NA).

REPRODUCTIVE HABITAT COMMENTS: Nests in hole dug mostly by male in dead or living (generally with dead heart) tree, stump, fence post, or utility pole; usually 0.6-4.6 m above ground, in forest opening, often near water.

STATE HABITAT COMMENTS: Prefered MI nest sites and foraging areas are in recently burned areas; use declines within 3 years post-burn (Harris 1982). In C OR they used beetle-infested, mature/old-growth mixed forests and logdepole pine; and avoided logged and young stands (Goggans et al. 1989). Nest tree diameters averaged 23 cm, most in larch in MI (Harris 1982) and 21 cm in a variety of spp in OR (Bull et al. 1986). Most nests were in trees dead < 5 yrs (Bull et al. 1986). Nests were located in dense stands, aveage 1171 trees/ha (Harris 1982). In W MI, larch was preferred foraging species found by (Harris 1982). In OR, roost sites were in lodgepole pine, in cankers, scars, mistletoe clumps, or directly on the trunk (Goggans et al. 1989).

---FOOD HABITS---
FOOD HABITS: INVERTIVORE

GLOBAL FOOD COMMENTS: Eats mainly insects obtained by flaking bark from trees (usually dead conifers); also eats spiders, fruits, nuts, and some cambium (BENT1964A).

STATE FOOD COMMENTS: Wood-boring beetles make up 3/4 of diet (Bent 1964).

---SPECIES ECOLOGY---
GLOBAL ECOLOGY COMMENTS:

STATE ECOLOGY COMMENTS: Foraging in W MI was primarily by pecking, with scaling the next most common technique (Harris 1982); most feeding was by scaling in OR (Bull et al. 1986). Harris (1982) found males foraged lower on the tree than females. Harris (1982 compares ecology of black-backed, three-toed, and hairy woodpeckers. Size of home ranges of 3 indivuals in Oregon was 178, 307, and 810 ac; home range size varied inversely to proportion of unlogged and mature/old growth habitat (Goggans et al. 1989). They maintain intraspecific territories, but but have overlapping home ranges with other woodpecker species (Goggans et al. 1989).

---PHENOLOGY/SEASONALITY---
PHENOLOGY: DIURNAL

PRESENCE/ACTIVITY IN STATE:

month	first half	second half
JAN	P	P
FEB	P	P
MAR	P	P
APR	P	P
MAY	P	R
JUN	R	R
JUL	R	R
AUG	P	P
SEP	P	P
OCT	P	P
NOV	P	P
DEC	P	P

GLOBAL PHENOLOGY COMMENTS:

STATE PHENOLOGY COMMENTS: Breeding dates indicated are from onset of nesting to fledging (Davis 1961, Weydemeyer 1975, Johnsgard 1986).

---REPRODUCTION---
COLONIAL/AGGREGATE BREEDER:

GLOBAL REPRODUCTION COMMENTS: Clutch size 2-6 (usually 4). Incubation (?) 14 days, by both sexes. Young tended by both parents.

STATE REPRODUCTION COMMENTS: Both adults excavate nest, primarily the male (Short 1974). Both adults incubate; exchange at 4 hr intervals (Anon. 1992). Young seen out of nest in mid-Jul (Davis 1961). Nest dates probably similar to those for Colorado: late May to early Jul (Johnsgard 1986). Young in nest near Fortine on May 25 and Jun 4 (Weydemeyer 1975). Young fledge at about 24 days (Anon. 1992). Success rate at 19 nests in OR was 63% (Goggans et al. 1989).

---MANAGEMENT---
GLOBAL MANAGEMENT COMMENTS:

STATE MANAGEMENT COMMENTS: Management of this species tied to maintenance of fire, disease and decay: heartrot for nests, diseased trees for roosts, and trees with large beetle populations for foraging (Harris 1982, Goggans et al. 1989, Rodrick and Milner 1991). Recommendations include: 1) establish Woodpecker Management Areas of approx. 1000 ac in pine dominated habitat, with no salvage sales allowed (Goggans et al. 1989, Rodrick and Milner 1991); 2) limit insecticide use (Rodrick and Milner 1991); and 3) for harvested areas, retain 12 snags > 17"dbh/100 ac (Rodrick and Milner 1991).

---ADDITIONAL ATTRIBUTES---
LENGTH (cm): 24 WEIGHT (g): 72

---REFERENCES---

--SOURCECODE	--CITATION
U92ANO01MTUS	Anon. 1992. Survey techniques to monitor three-toed and black-backed woodpeckers. [unpubl. rep.] Workshop on Monitoring Cavity-Nesters, February 24-25, 1992. Sponsored by the Wildl. Soc., Ore Chapt. 9 pp.
B39BEN01MTUS	Bent, A. C. 1939. Life histories of North American woodpeckers, U.S. Natl. Mus. Bull. 174. Washington, D.C.
U86BUL01MTUS	Bull, E. L., S. R. Peterson, and J. W. Thomas. 1986. Resource partitioning among woodpeckers in northeastern Oregon. USDA For. Serv. Pac. Northw. Res. Station, Portland, Ore., Res. Note PNW-444. 19 pp.
U61DAV01MTUS	Davis, C. V. 1961. A Distributional Study of the Birds of Montana. PhD Thesis, Oregon State University, Corvallis. 462 pp.
U89GOG01MTUS	Goggans, R., R. D. Dixon and L. C. Seminara. 1989. Habitat use by three-toed and black-backed woodpeckers, Deschutes National Forest, Oregon. Ore. Dept. Fish Wildl. - Nongame Wildl. Prog. USDA Deschutes Natl. For. Tech. Rep. 87-3-02. 43 pp.
U82HAR02MTUS	Harris, M. A. 1982. Habitat use among woodpeckers in forest burns. M.S. thesis. Univ. Mont. 62 pp.
B86JOH01MTUS	Johnsgard, P. A. 1986. Birds of the Rocky Mountains with particular reference to national parks in the Northern Rocky Mountain region. Colorado Associated University Press, Boulder. xi + 504 pp.
U91ROD01MTUS	Rodrick, E. and R. Milner (eds). 1991. Management recommendations for Washington's priority habitats and species. Wash. Dept. Wildl., Olympia. [Unpubl. Rep.]
A74SHO01MTUS	Short, L. L. 1974. Habits and interactions of North American three-toed woodpeckers (Picoides arcticus and Picoides tridactylus). Amer. Mus. Novitates 2547:1-42.
A85SKA01MTUS	Skaar, D., D. Flath and L. S. Thompson. 1985. Montana bird distribution. Monograph #3, proceedings, Montana Academy of Sciences, Suppl. Vol. 44. 71 pp.
A75WEY01MTUS	Weydemeyer, W. 1975. Half-century record of the breeding birds of the Fortine area, Montana: nesting data and population status. Condor 77:281-287.
A74BOC01NAUS	Bock, C. E. and J. H. Bock. 1974. On the geographical ecology and evolution of the three-toed woodpeckers, Picoides tridactylus and P. arcticus. Amer. Midl. Nat., 92(2):397-405.

B83COM01NAUS AOU Committee on Classification and Nomenclature. 1983. Check-list of North American birds, 6th ed. Amer. Ornithologists Union, Allen Press, Inc., Lawrence, Kansas.

B79HAR01NAUS Harrison, H. H. 1979. A field guide to western birds' nests. Houghton Mifflin Co., Boston. 279 pp.

B80TER01NAUS Terres, J. K. 1980. The Audubon Society encyclopedia of North American birds. Alfred A. Knopf, New York.

B82SHO01NAUS Short, L. L. 1982. Woodpeckers of the world. Delaware Mus. Nat. Hist., Monogr. Ser. No. 4, Greenville, Delaware. xviii + 676 pp.

B39BEN01NAUS Bent, A. C. 1939. Life histories of North American woodpeckers, U.S. Natl. Mus. Bull. 174. Washington, D.C.

B78HAR01NAUS Harrison, C. 1978. A field guide to the nests, eggs and nestlings of North American birds. Collins, Cleveland.

B83KIL01NAUS Kilham, L. 1983. Life history studies of woodpeckers of eastern North America. Nuttall Ornithol. Club Pub. No. 20. vii + 240 pp.

BUTEO REGALIS
FERRUGINOUS HAWK

AUTHORITY: (Gray, 1844)
HERITAGE REFERENCE: ABNKC19120

---TAXONOMY---
CLASS: AVES ORDER: FALCONIFORMES
FAMILY: ACCIPITRIDAE GENUS: BUTEO

TAXONOMIC COMMENTS:

SUBSPECIES COMMENTS: None (Committee on Classification and Nomenclature 1957).

---STATUS---
GLOBAL RANK: G4 USF&WS STATUS: C2
STATE RANK: S3B,SZN USFS REG. 1 STATUS: SENSITIVE

STATE SPECIES DESIGNATIONS:
GAME SPECIES: COMMERCIAL SPECIES:
SPORT FISH: FUR-BEARER:
PROTECTED NON-GAME: Y PEST:

GLOBAL STATUS COMMENTS: Local declines have been noted (e.g., A89WOF01NA), but a widespread decline was not evident as of the mid-1980s (B87FWS01NA). Total population estimated at 3000-4000 pairs, including 500-1000 pairs in Canada (A84SCH02NA). Loss of grassland not regarded as immediate threat (B87FWS01NA), though breeding range in southern Canada has been reduced due to intensive agriculture (B88PAL02NA). Historic breeding range in the southeastern U.S. apparently was much greater than at present (A88HAL01NA).

STATE STATUS COMMENTS: Populations are historically depressed due to habitat loss, nest-site disturbance, and potential competition with B. swainsoni. Conservation priority ranked 11th of 134 neotropical migrant species in Montana (Carter and Baker no date). National trend BBS: +13.5% (1988-89), +0.5% (1966-89) (Droege and Sauer 1990).

---DISTRIBUTION---
COUNTY DISTRIBUTION:

COUNTYNAME	OCCURRENCE STATUS	MIGRATORY STATUS
Beaverhead	P	SP
Big Horn	P	SP
Blaine	P	SP
Broadwater	P	SP
Carbon	P	SP
Carter	P	T
Cascade	P	SP
Chouteau	P	SP
Custer	P	SP
Daniels	P	T
Dawson	P	SP
Deer Lodge	P	T
Fallon	P	T
Fergus	P	SP
Flathead	P	SP
Gallatin	P	SP
Garfield	P	T
Glacier	P	SP
Golden Valley	P	SP
Granite	P	SP
Hill	C	SC
Jefferson	P	SC
Judith Basin	P	SP
Lake	P	T
Lewis and Clark	P	SP
Liberty	P	SP
Lincoln	C	SC
Madison	P	SP

Mccone	C	SC
Meagher	P	SP
Mineral	C	SC
Missoula	P	SP
Musselshell	P	SP
Park	P	SP
Petroleum	P	SP
Phillips	P	SP
Pondera	P	SP
Powder River	P	SP
Powell	P	SP
Prairie	P	SP
Ravalli	P	SP
Richland	C	SC
Roosevelt	P	SP
Rosebud	P	SP
Sanders	P	SP
Sheridan	P	T
Silver Bow	P	SP
Stillwater	P	SP
Sweet Grass	P	SP
Teton	C	SC
Toole	P	SP
Treasure	P	SP
Valley	P	T
Wheatland	P	T
Wibaux	P	SP
Yellowstone	P	SP

ECOREGION DISTRIBUTION:

ECOREGION	OCCURRENCE STATUS	MIGRATORY STATUS
2112M	C	SC
3111L	C	SC
3112L	P	SP
3112M	C	SC
3151A	P	SP

WATERSHED DISTRIBUTION:

WATERSHED CODE	OCCURRENCE STATUS	MIGRATORY STATUS
100100	P	SP
100200	P	T
100301	C	SC
100302	P	SP
100401	P	SP
100402	P	SP
100500	P	SP
100600	C	SC
100700	P	SP
100800	P	SP
100901	C	SC
100902	C	SC
101000	P	SP
101102	P	T
101202	P	SP
170101	C	SC
170102	C	SC

MINIMUM ELEVATION: MAXIMUM ELEVATION:

GLOBAL RANGE COMMENTS: BREEDS: eastern Washington, southern Alberta, southern Saskatchewan, (formerly) southwestern Manitoba, south to eastern Oregon, Nevada, Arizona, New Mexico, north-central Texas, western Oklahoma, and western Kansas. WINTERS: primarily southwestern and south-central U.S. south to Baja California and central mainland of Mexico; in the U.S., in largest numbers in western Texas, eastern New Mexico, and western Oklahoma (B88R0001NA).

STATE RANGE COMMENTS: Breeds east (and very rarely west) of the continental divide (Bergeron et al. 1992). Highest numbers in the southwest (Restani 1989, Atkinson 1992) and southeast (Ensign 1983). Sighted throughout the state during migrations. In the Galletin Valley it is most often seen near Three Forks (Skaar 1969).

---MIGRATION---

NON-MIGRANT:	LOCAL MIGRANT: Y
BREEDS IN STATE: Y	DISTANT MIGRANT: Y
WINTERS IN STATE:	MIGRATORY TRANSIENT:
IRREGULAR APPEARANCE:	MIGRATION WITHIN STATE:

GLOBAL MIGRATION COMMENTS: Arrives in northern breeding range (South Dakota) by March-early April, in Utah and Colorado mostly in late February-early March; yearlings arrive later. Adults depart northern end of breeding range by late October; young depart in August. Wintering areas of grassland and desert shrub breeders are mainly separate. (A87SCH01NA). Alberta populations winter mainly in Texas. In southern breeding range, may be short-distance migrant or possibly sedentary (B88PAL02NA).

STATE MIGRATION COMMENTS: Typical arrival period is from late March to mid-April (Davis 1961).

---HABITAT---
MARINE:

ESTUARINE:

RIVERINE:

LACUSTRINE:

PALUSTRINE: RIPARIAN

TERRESTRIAL: SAVANNAH
GRASSLAND/HERBACEOUS
DESERT
CLIFF

SUBTERRAN:

GLOBAL SPECIAL FACTORS:

STATE SPECIAL FACTORS:

GLOBAL HABITAT COMMENTS: Open country, primarily prairies, plains and badlands; sagebrush, saltbush-greasewood shrubland, periphery of pinyon-juniper and other woodland, desert. In the southern Great Plains, common at black-tailed prairie dog colonies in winter (A87SCH01NA). In southeastern Alberta, nesting density higher in areas of moderate cultivation than in grassland, but density less in areas of extensive (more than 30%) cultivation (A89SCH01NA).

REPRODUCTIVE HABITAT COMMENTS: Nests in tall trees or willows along streams or on steep slopes, in junipers (Utah), on cliff ledges, river-cut banks, hillsides, on power line towers, sometimes on sloped ground on the plains or on mounds in open desert. Generally avoids areas of intensive agriculture or human activity.

STATE HABITAT COMMENTS: Most nests in SW MT are found on rimrock and cliffs (Atkinson 1992) or willows (Restani 1991), while most are on the ground in SE (Ensign 1983) and NC MT (Black n.d.). Most are on southern exposures (Ensign 1983, Atkinson 1992) on the upper part of the slope (Restani 1991, Atkinson 1992). Habitat surrounding nest sites in SW MT is a mixture of grasslands and shrublands (Atkinson 1992).

---FOOD HABITS---
FOOD HABITS: CARNIVORE

GLOBAL FOOD COMMENTS: Eats small mammals (jackrabbits, cottontails, ground squirrels, voles, mice, gophers, etc.), reptiles (snakes, lizards), and occasionally birds (grouse, meadowlark, etc.). Also some large insects (beetles, grasshoppers, crickets). Hunts from perch or while flying.

STATE FOOD COMMENTS: In SE MT white-tailed jackrabbits represent the greatest frequency (24.4%) and biomass of prey items, followed by western meadowlarks (18.3%), thirteen-lined ground squirrels (12.7%), and northern pocket gophers (11.7%) (Ensign 1983). In SW MT (Restani 1991, Atkinson 1992) ground squirrels (S. armatus or elegans) were the most frequent food item (45-62%); other items > 10% included passerines, grasshoppers, and voles.

---SPECIES ECOLOGY---
GLOBAL ECOLOGY COMMENTS: First year mortality generally is around 66% in the Great Plains region (A87SCH01NA). Up to 8-10 nests per 100 sq. km if local conditions are favorable (see B88PAL02NA for density data for several areas.

STATE ECOLOGY COMMENTS: In SE MT, predation and sibling fratricide were the major causes of nestling mortality, accounting for 34 and 27%, respectively, of total progeny loss (Ensign 1983). Territories often contain alternate nests (Atkinson 1992). Distribution appears clumped, with large areas of apparently suitable habitat unoccupied (Atkinson 1992).

---PHENOLOGY/SEASONALITY---
PHENOLOGY: DIURNAL

PRESENCE/ACTIVITY IN STATE:

month	first half	second half
JAN		
FEB		
MAR		
APR		R
MAY	R	R
JUN	R	R
JUL	R	R
AUG	R	R
SEP	R	R
OCT		
NOV		
DEC		

GLOBAL PHENOLOGY COMMENTS: Hunts most frequently near sunrise and sunset (B82EVA01NA).

STATE PHENOLOGY COMMENTS:

---REPRODUCTION---
COLONIAL/AGGREGATE BREEDER:

GLOBAL REPRODUCTION COMMENTS: See B88PAL02NA and A88HAL01NA for egg dates in different areas. Clutch size usually 3-4. Incubation about 32-33 days, mostly by female; male provides food. Young fledge in 35-50 days (males before females), depend on parents for several weeks more. No evidence that yearlings breed. Clutch size, fledging rate, and/or breeding density tend to vary with prey (especially jackrabbit or ground squirrel) availability. Evidently often does not renest if clutch is lost.

STATE REPRODUCTION COMMENTS: Clutch size averaged 2.69 in SE MT (Ensign 1983). Nesting success was higher in SW than SE MT (81% vs 26%) as was number of young per successful nest (2.36 vs 1.67) (Ensign 1983, Atkinson 1992). Nesting dates range: late Apr-15 Jul (Davis 1961, Restani 1991).

---MANAGEMENT---
GLOBAL MANAGEMENT COMMENTS: Sensitive to disturbance by humans during incubation (prone to desert nest or eggs if disturbed); undisturbed buffer zone of at least 250 m recommended, larger when prey scarce (A85WHI01NA). Artificial nests have been used to increase number of nesting pairs (A84SCH01NA). See A88HAL01NA and A88LEF01NA for additional recommendations for the southwestern U.S.

STATE MANAGEMENT COMMENTS: The following are recommended (Ensign 1983, Andersen et al. 1990, Atkinson 1992, Reichel et al. 1993): 1) minimize disturbance in nesting territory, especially within 450 m of nest; 2) protect isolated trees and stringers should be protected from livestock in nesting habitat; 3) prescribed burning may increase habitat suitability in shrub-dominated areas; 4) discourage practices which increase exotic plant species number or dominance; 5) use of artificial nesting platforms may increase ferruginous hawk density in some circumstances.

---ADDITIONAL ATTRIBUTES---
LENGTH (cm): 58 WEIGHT (g): 1231

---REFERENCES---

--SOURCECODE	--CITATION
A90AND01MTUS	Andersen, D. E., O. J. Rongstad, and W. R. Mytton. 1990. Home-range changes in raptors exposed to increased human activity levels in southeastern Colorado. Wildl. Soc. Bull. 18:134-142.
U92ATK01MTUS	Atkinson, E. C. 1992. Ferruginous hawk (BUTEO REGALIS) inventories on the Dillon Resource Area of southwest Montana: 1992. Montana Natural Heritage Program for Bureau of Land Management, Dillon Resource Area. 34 pp. plus appendices.
B92BER01MTUS	Bergeron, D., C. Jones, D. L. Genter, and D. Sullivan. 1992. P. D. Skaar's Montana Bird Distribution, Fourth Edition. Special Publication No. 2. Montana Natural Heritage Program, Helena. 116 pp.
UNDBLA01MTUS	Black, A. no date. Ferruginous hawk reproduction and habitat survey. Unpubl. Rept. N. Rockies Cons. Coop., Jackson, WY. 13 pp. + appendices.
UNDCAR01MTUS	Carter, M., and K. Barker. no date. An interactive database for setting conservation priorities for western neotropical migrants. unpublished photocopy.
B83COM01MTUS	Committee on classification and nomenclature. 1983. Checklist of North American birds, 6th ed. Amer. Ornithologists Union, Allen Press, Inc., Lawrence, KA.
U610AV01MTUS	Davis, C. V. 1961. A Distributional Study of the Birds of Montana. PhD Thesis, Oregon State University, Corvallis. 462 pp.
N90DRO01MTUS	Droege, S. and J. R. Sauer. 1990. North American breeding bird survey annual summary, 1989. USDI Fish Wildl. Serv. Biol. Report 90(8). 22 pp.
A87DUB01MTUS	DuBois, K. and D. Becker. 1987. Identification of Montana's birds of prey. Montana Outdoors Nov/Dec 1987.
U83ENS01MTUS	Ensign, J. T. 1983. Nest site selection, productivity, and food habits of ferruginous hawks in southeastern Montana. M.S. thesis, Montana State University. 85pp.
U89RES01MTUS	Restani, M. 1989. Resource partitioning among three species of hawks in the Centennial Valley, Montana. MS Thesis, Montana State University, Bozeman. 86 pp.
A91RES01MTUS	Restani, M. 1991. Resource partitioning among three Buteo species in the Centennial Valley, Montana. Condor 93:1007-1010.
A87SCH01MTUS	Schmutz, J. K. 1987. The effect of agriculture on ferruginous and Swainson's hawks. Journal of Range Management 40(5): 438-440.

A87SCH02MTUS Schmutz, J. K. 1987. Factors limiting the size of the breeding population of ferruginous hawks. In: Endangered species in the prairie provinces, 9:189-191. Holroyd, G. L., et al (eds). Alberta Culture, Historical Resources Division.

A87SCH03MTUS Schmutz, J. K. 1987. Ferruginous hawk. In: Endangered species in the prairie provinces, 9:207. Holroyd, G. L., et al (eds). Alberta culture, Historical Resources Division.

B69SKA01MTUS Skaar, P. D. 1969. Birds of the Bozeman Latilong. Published by the author, Bozeman, MT. 132 pp.

A81SUT01MTUS Suter, G. W., II, and J. L. Jones. 1981. Criteria for golden eagle, ferruginous hawk and prairie falcon nest site protection. Raptor Research 15:12-18.

A87SCH01NAUS Schmutz, J. K. and R. W. Fyfe. 1987. Migration and mortality of Alberta ferruginous hawks. Condor 89:169-174.

A84SCH02NAUS Schmutz, J. K. 1984. Ferruginous and Swainson's hawk abundance and distribution in relation to land use in southeastern Alberta. Journal of Wildlife Management 48:1180-1187.

A69ANG01NAUS Angell, T. 1969. A study of the ferruginous hawk: Adult and brood behavior. Living bird, 8th annual, pp. 225-41.

B93FIS01NAUS Fisher, A. K. 1893. The hawks and owls of the United States in their relation to agriculture. Wash. U.S. Dept. of Agric. Bull. no. 6. 210 pp.

A85WHI01NAUS White, C. M., and T. L. Thurow. 1985. Reproduction of ferruginous hawks exposed to controlled disturbance. Condor 87:14-22.

A84SCH01NAUS Schmutz, J. K., D. A. Moore and A. R. Smith. 1984. Artificial nests for ferruginous and Swainson's hawks. Journal of Wildlife Management 48:1009-1013.

B78HAR01NAUS Harrison, C. 1978. A field guide to the nests, eggs and nestlings of North American birds. Collins, Cleveland.

B66GOD01NAUS Godfrey, W. Earl. 1966. The birds of Canada. National Museums of Canada. Ottawa. 428 pp.

B74SNO02NAUS Snow, C. 1974. Habitat management series for unique or endangered species, Report No. 13, Ferruginous Hawk, BUTEO REGALIS. Bureau of Land Management, U.S. Dept. of Int., Technical Note, T/N-255, Denver.

B76FYF01NAUS Fyfe, R. W., and R. R. Olendorff. 1976. Minimizing the dangers of nesting studies to raptors and other sensitive species. Canadian Wildl. Serv. Occas. Pap. 23. 17 pp.

B83COM01NAUS AOU Committee on Classification and Nomenclature. 1983. Check-list of North American birds, 6th ed. Amer. Ornithologists Union, Allen Press, Inc., Lawrence, Kansas.

B80TER01NAUS Terres, J. K. 1980. The Audubon Society encyclopedia of North American birds. Alfred A. Knopf, New York.

B82EVA01NAUS Evans, D. L. 1982. Status reports on twelve raptors. U.S. Department of the Interior, Fish and Wildlife Service, Special Scientific Report No. 238. 68 pp.

B87FWS01NAUS U. S. Fish and Wildlife Service, Office of Migratory Bird Management. 1987. Migratory nongame birds of management concern in the United States: the 1987 list.

B88PAL02NAUS Palmer, R. S. (ed). 1988. Handbook of North American birds. Vol. 5. Yale Univ. Press, New Haven. 465 pp.

A89SCH01NAUS Schmutz, J. K. 1989. Hawk occupancy of disturbed grasslands in relation to models of habitat selection. Condor 91:362-371.

A88HAL01NAUS Hall, R. S., et al. 1988. Ferruginous hawk. Pages 111-118 in Glinski et al., eds. Proc. Southwest Raptor Manage. Symp. and Workshop. Nat. Wildl. Fed. Sci. and Tech. Ser. No. 11.

A88LEF01NAUS Lefranc, M. N., Jr. and R. L. Glinski. 1988. Southwest raptor management issues and recommendations. Pp. 375-392 in: Glinski et al., (eds). Proc. Southwest raptor management symposium and workshop. Nat. Wildl. Fed. Sci. and Tech. Ser. No. 11.

B87PEN01NAUS Pendleton, B. A. Giron, et al. 1987. Raptor management techniques manual. National Wildlife Federation, Sci. and Tech. Ser. No. 10. 420 pp.

A89WOF01NAUS Woffinden, N. D., and J. R. Murphy. 1989. Decline of a ferruginous hawk population: a 20-year summary. J. Wildl. Manage. 53:1127-1132.

B90JOH01NAUS Johnsgard, P. A. 1990. Hawks, eagles, and falcons of North America. Smithsonian Inst. Press, Washington, D.C. xvi + 403 pp.

A90BEC02NAUS Becahrd, M. J., et al. 1990. Nest sites and habitats of sympatric hawks (BUTEO spp.) in Washington. J. field Ornithol. 61:159-170.

B92EHR01NAUS Ehrlich, P. R., D. S. Dobkin and D. Wheye. 1992. Birds in jeopardy: the imperiled and extinct birds of the United States and Canada, including Hawaii and Puerto Rico. Stanford Univ. Press, Stanford, California. 259 pp.

B88ROO01NAUS Root, T. 1988. Atlas of wintering North American birds. An analysis of Christmas bird count data. Univ. Chicago Press. 336 pp.

CHARADRIUS MONTANUS
MOUNTAIN PLOVER

AUTHORITY: Townsend, 1837
HERITAGE REFERENCE: ABNNB03100

---TAXONOMY---
CLASS: AVES ORDER: CHARADRIIFORMES
FAMILY: CHARADRIIDAE GENUS: CHARADRIUS

TAXONOMIC COMMENTS: Often placed in the genus EUPODA (AOU 1983).

SUBSPECIES COMMENTS: None (Committee on Classification and Nomenclature 1957).

---STATUS---
GLOBAL RANK: G3 USF&WS STATUS: C2
STATE RANK: S2B,S2N USFS REG. 1 STATUS: SENSITIVE

STATE SPECIES DESIGNATIONS:
GAME SPECIES: COMMERCIAL SPECIES:
SPORT FISH: FUR-BEARER:
PROTECTED NON-GAME: Y PEST:

GLOBAL STATUS COMMENTS: Early decline probably related at least in part to market hunting. Breeding habitat much reduced by agriculture. Status survey (A91LEA01NA) indicated recent declines of 50-89% in distribution and/or population size.

STATE STATUS COMMENTS: In both MT and nationally, range and abundance have been reduced considerably in the last century; there is no evidence that this is stabilizing (FaunaWest Wildlife Consultants 1991, Knopf 1991). Knopf (1991) recommended upgrading federal status to C1. Population estimtes for MT range from 750-1000 (Knopf 1991) to 1487-2820 (FaunaWest Wildlife Consultants 1991). Ranked #1 in conservation effort needs for Montana (Carter and Barker n.d.).

---DISTRIBUTION---
COUNTY DISTRIBUTION:

COUNTYNAME	OCCURRENCE STATUS	MIGRATORY STATUS
Beaverhead	P	T
Big Horn	C	SC
Blaine	P	SP
Broadwater	P	T
Carter	P	S?
Cascade	P	SP
Chouteau	P	T
Custer	P	T
Daniels	C	SC
Dawson	P	T
Deer Lodge	P	T
Fallon	P	SP
Fergus	P	S?
Flathead	P	SP
Gallatin	P	T
Garfield	P	S?
Glacier	P	T
Golden Valley	P	S?
Hill	P	T
Jefferson	C	SC
Judith Basin	C	SC
Lake	P	T
Lewis and Clark	C	SC
Liberty	P	SP
Lincoln	P	T
Madison	P	T
Mccone	P	T
Meagher	P	S?
Musselshell	P	T
Park	P	SP
Petroleum	P	SP

Phillips	P	SP
Pondera	P	T
Prairie	P	T
Richland	P	T
Roosevelt	P	SP
Rosebud	P	T
Sheridan	P	SP
Silver Bow	P	S?
Stillwater	P	T
Sweet Grass	P	T
Teton	P	T
Treasure	C	SC
Valley	P	SP
Wheatland	P	T
Wibaux	C	SC
Yellowstone	P	SP

ECOREGION DISTRIBUTION:

ECOREGION	OCCURRENCE STATUS	MIGRATORY STATUS
2112M	P	T
3111L	P	SP
3112L	P	T
3112M	P	SP

WATERSHED DISTRIBUTION:

WATERSHED CODE	OCCURRENCE STATUS	MIGRATORY STATUS
100100	C	SC
100200	C	SC
100301	P	SP
100302	P	SP
100401	P	T
100402	P	SP
100500	P	SP
100600	P	SP
100700	P	T
100800	P	T
100901	C	SC
100902	C	SC
101000	P	T
101102	P	T
170101	P	T
170102	P	T

MINIMUM ELEVATION: MAXIMUM ELEVATION:

GLOBAL RANGE COMMENTS: BREEDS: extreme southern Alberta and northern Montana south to central New Mexico, western Texas, and western Oklahoma; now mainly in Colorado, Wyoming, and Montana (A91LEA01NA). WINTERS: central California, southern Arizona, central and coastal Texas south to southern Baja California and northern mainland of Mexico; the only significant remaining wintering grounds are in the San Joaquin Valley and Salton Sea area, California (A91LEA01NA).

STATE RANGE COMMENTS: Currently breeds in central, north-central, and southwest parts of state (FaunaWest Wildlife Consultants 1991, Bergeron et al. 1992). Historic range probably encompassed most of eastern and parts of southwest MT; records are summarized in FaunaWest Wildlife Consultants (1991).

---MIGRATION---

NON-MIGRANT:	LOCAL MIGRANT:
BREEDS IN STATE: Y	DISTANT MIGRANT: Y
WINTERS IN STATE:	MIGRATORY TRANSIENT:
IRREGULAR APPEARANCE:	MIGRATION WITHIN STATE:

GLOBAL MIGRATION COMMENTS: Generally arrives in northern nesting range mid-March to mid-May (B29BEN01NA).

STATE MIGRATION COMMENTS: MT is at the northern edge of breeding range. Migration occurs to the south (Committee on Classification and Nomenclature 1983).

---HABITAT---
MARINE:

ESTUARINE:

RIVERINE:

LACUSTRINE:

PALUSTRINE:

TERRESTRIAL: GRASSLAND/HERBACEOUS
DESERT
CROPLAND/HEDGEROW

SUBTERRAN:

GLOBAL SPECIAL FACTORS:

STATE SPECIAL FACTORS: PRAIRIE DOG TOWNS

GLOBAL HABITAT COMMENTS: Nonbreeding: short-grass plains and fields, plowed fields and sandy deserts (883COM01NA).

REPRODUCTIVE HABITAT COMMENTS: Nests on high plains or shortgrass prairie. Nests on the ground in a shallow depression that may be lined with plant material and/or adjacent to cattle dung.

STATE HABITAT COMMENTS: Breeding plovers are almost always associated with areas of extremely short native grasslands showing substanial amounts of bare ground (Graul 1975, Graul and Webster 1976, Knowles et al. 1982, Olson 1984, Olson and Edge 1985, Olson-Edge and Edge 1987). Additionally, areas used by mountain plovers are usually flat (slopes <12%) (Graul 1975, Knowles et al. 1982, FaunaWest Wildlife Consultants 1991). In central MT, they show strong selection to use black-tailed prairie dog towns within the big sagebrush/blue grama habitat type (Knowles et al. 1982, Olson-Edge and Edge 1987). These towns provide greater horizontal visability, higher percentage bare ground, more burrows for refugia, and higher diversity of forbs than adjacent areas (Olson 1985). Mountain plovers will use towns as small as 3 ha (Knowles et al. 1982), but the average on one study was 57.5 ha (Knowles and Knowles 1984) and ranged from 6-50 ha in another (Olson-Edge and Edge 1987). Mountain plovers are not usually associated with prairie dog towns in C and SW MT, SE WY, and NE CO, but birds are found in areas where vegetation height is <10 cm (Giezentanner 1970, Graul and Webster 1976, FaunaWest Wildlife Consultants 1991). Plovers in these areas are associated primarily with short-grass prairie (needle-and-thread grass/ blue grama habitat type) less than 10 cm tall, and with a history of overgrazing (Giezentanner 1970, Graul and Webster 1976, Knowles et al. 1982, Leachman and Osmundson 1990, FaunaWest Wildlife Consultants 1991).

---FOOD HABITS---
FOOD HABITS: INVERTIVORE

GLOBAL FOOD COMMENTS: Feeds primarily on insects (grasshoppers, crickets, beetles, flies). Takes prey from the ground.

STATE FOOD COMMENTS: Insect abundance and diversity on and off prairie dog towns was found to be nearly equal by Olson (1984, 1985). She speculated that plover foraging efficiency may be greater on than off prairie dog towns.

---SPECIES ECOLOGY---
GLOBAL ECOLOGY COMMENTS: May form large flocks of over 100 birds during the winter.

STATE ECOLOGY COMMENTS: Estimates for densities at Charles M. Russel National Wildlife Refuge (CMR) were 16.2 breeding plovers per 100 ha in prairie dog towns (or 0.28 birds per sq km in the entire area) (Olson 1984). Town size was negatively correlated with plover density. At CMR, courtship, locomotion and maintenance activities decreased with increased temperature on daily and seasonal basis (Olson 1984). Records indicate that mountain plovers are less common today than in 1900 (Davis 1961), perhaps due to increased irrigated agriculture and/or prairie dog control (Johnsgard 1986, FaunaWest Wildlife Consultants 1991).

---PHENOLOGY/SEASONALITY---
PHENOLOGY: DIURNAL

PRESENCE/ACTIVITY IN STATE:

month	first half	second half
JAN		
FEB		
MAR		
APR	A	A
MAY	A	R
JUN	R	R
JUL	R	R
AUG	R	R
SEP		
OCT		
NOV		
DEC		

GLOBAL PHENOLOGY COMMENTS:

STATE PHENOLOGY COMMENTS: Birds arrive on the breeding gounds in early April (Olson 1984). Only 2 late summer/fall records; departure date therefore poorly established (Skaar, field notes).

---REPRODUCTION---
COLONIAL/AGGREGATE BREEDER:

GLOBAL REPRODUCTION COMMENTS: Breeding begins late Apr. in south to late May in north. Both sexes, in turn, incubate 3, sometimes 2-4, eggs for 29 days. Or female may lay second clutch while male incubates first clutch. Nestlings precocial.

STATE REPRODUCTION COMMENTS: Nesting occurs from 19 May to 18 July (Olson 1984). Young chicks have been observed between 6/15-7/23 (Davis 1961). Detailed habitat of nest sites is described by Olson (1984).

---MANAGEMENT---
GLOBAL MANAGEMENT COMMENTS: Not well protected by existing laws and regulations; USFWS regions 1, 6, and 8 are coordinating on "future study proposals" (A91LEA01NA).

STATE MANAGEMENT COMMENTS: Mountain plovers are associated with short vegetation and high percentages of bare ground, characteristics often associated with prairie dog towns and/or intensive grazing (Graul and Webster 1976, Knowles et al. 1982). Management practices should emulate these parameters and may include practices to: 1) identify, map, and protect areas where mountain plovers currently nest; 2) maintain areas of intensive grazing on level (<10% gradient) short-grass-prairie communities; 3) combine light to moderate grazing with prescribed burning, which has the added benefit of reducing woody species (Wershler 1989); 4) identify, map and protect prairie dog towns located on level short-grass prairie habitats to ensure these concentrations persist; 5) restrict off-road vehicle use between 1 April

and 1 August in areas identified as potential mountain plover habitat; 6) areas of potential mountain plover habitat should not be converted to agriculture nor have "range improvements" that increase forage for livestock (particularly planting exotic grasses); 7) efforts should be made to reduce the likelyhood of invasion by non-native species such as (but not restricted to) cheatgrass, leafy spurge, and knapweed.

---ADDITIONAL ATTRIBUTES---
LENGTH (cm): 23 WEIGHT (g): 114

---REFERENCES---

--SOURCECODE	--CITATION
B29BEN01MTUS	Bent, A. C. 1929. Life histories of North American shorebirds (Part II). U.S. Natl. Mus. Bull. 146. Washington, D.C.
B92BER01MTUS	Bergeron, D., C. Jones, D. L. Genter, and D. Sullivan. 1992. P. D. Skaar's Montana Bird Distribution, Fourth Edition. Special Publication No. 2. Montana Natural Heritage Program, Helena. 116 pp.
UNDCAR01MTUS	Carter, M., and K. Barker. no date. An interactive database for setting conservation priorities for western neotropical migrants. unpublished photocopy.
B83COM01MTUS	Committee on classification and nomenclature. 1983. Checklist of North American birds, 6th ed. Amer. Ornithologists Union, Allen Press, Inc., Lawrence, KA.
U61DAV01MTUS	Davis, C. V. 1961. A Distributional Study of the Birds of Montana. PhD Thesis, Oregon State University, Corvallis. 462 pp.
U91FAU03MTUS	FaunaWest Wildlife Consultants. 1991. Status and breeding distribution of the mountain plover in Montana. Report to USDI Bureau of Land Management. FaunaWest Wildlife Consultants, Boulder, MT, 44pp.
N70GIE01MTUS	Giezentanner, J. B. 1970. Avian distribution and population fluctuations on the shortgrass prairie of north central Colorado. U.S. Internat. Biol. Prog, Grassland Biome Tech. Report 62. 95 pp.
A75GRA01MTUS	Graul, W. D. 1975. Breeding biology of the mountain plover. Wilson Bull. 87:6-31.
A76GRA01MTUS	Graul, W. D. and L. E. Webster. 1976. Breeding status of the mountain plover. Condor 78:265-267.
B86JOH01MTUS	Johnsgard, P. A. 1986. Birds of the Rocky Mountains with particular reference to national parks in the Northern Rocky Mountain region. Colorado Associated University Press, Boulder. xi + 504 pp.
U91KNO01MTUS	Knopf, F. L. 1991. Status and conservation of mountain plovers: the evolving regional effort. Report of research activities, USFWS National Ecology Research Center, Ft. Collins, CO, 9pp.
A84KNO01MTUS	Knowles, C. J. and P. R. Knowles. 1984. Additional records of mountain plovers using prairie dog towns in Montana. Prairie Nat. 16:183-186.
A82KNO01MTUS	Knowles, C. J., C. J. Stoner and S. P. Gieb. 1982. Selective use of black-tailed prairie dog towns by mountain plovers. Condor 84:71-74.
U90LEA11MTUS	Leachman, B. and B. Osmundson. 1990. Status of the mountain plover: a literature review. Unpublished report to USFS, Fish and Wildlife Enhancement, Golden, CO, 83 pp.
U84OLS01MTUS	Olson, S. L. 1984. Density and distribution, nest site selection, and activity of the mountian plover on the CMR National Wildlife Refuge. M.S. Thesis, Univ. of MT.
A85OLS02MTUS	Olson, S. L. 1985. Mountain plover food items on and adjacent to a prairie dog town. Prairie Naturalist 17(2):83-90.
A85OLS01MTUS	Olson, S. L. and D. Edge. 1985. Nest site selection by mountain plovers in northcentral Montana. Journal of Range Management 38(3):280-282.

A87OLS01MTUS Olson-Edge, S. L. and W. D. Edge. 1987. Density and distribution of the mountain plover on the Charles M. Russell National Wildlife Refuge. The Prairie Naturalist. 19(4):233-238.

UNDSKA01MTUS Skaar, P. D. No date. [Field notes on rare birds in Montana (unpublished, unbound).]

A85SKA01MTUS Skaar, D., D. Flath and L. S. Thompson. 1985. Montana bird distribution. Monograph #3, proceedings, Montana Academy of Sciences, Suppl. Vol. 44. 71 pp.

U89WER01MTUS Wershler, C. R. 1989. A management strategy for mountain plovers in Alberta. Proc. Prairie Cons. Endangered Sp. Workshop, Sask. Nat. Hist. Soc. and Can. Plains Res. Center. 5 pp.

B83COM01NAUS AOU Committee on Classification and Nomenclature. 1983. Check-list of North American birds, 6th ed. Amer. Ornithologists Union, Allen Press, Inc., Lawrence, Kansas.

B78HARD1NAUS Harrison, C. 1978. A field guide to the nests, eggs and nestlings of North American birds. Collins, Cleveland.

B74OBE01NAUS Oberholser, H. C. 1974. The bird life of Texas. 2 Vols. University of Texas Press, Austin.

B29BEN01NAUS Bent, A. C. 1929. Life histories of North American shorebirds (Part II). U.S. Natl. Mus. Bull. 146. Washington, D.C.

B80TER01NAUS Terres, J. K. 1980. The Audubon Society encyclopedia of North American birds. Alfred A. Knopf, New York.

A91LEA01NAUS Leachman, B. and F. Knopf. 1991. Mountain plover gets attention. Fish and Wildlife News, June-July-August 1991, pp. 15, 22.

B92EHR01NAUS Ehrlich, P. R., D. S. Dobkin and D. Wheye. 1992. Birds in jeopardy: the imperiled and extinct birds of the United States and Canada, including Hawaii and Puerto Rico. Stanford Univ. Press, Stanford, California. 259 pp.

AEGOLIUS FUNEREUS
BOREAL OWL

AUTHORITY: (Linnaeus, 1758)
HERITAGE REFERENCE: ABNSB15010

---TAXONOMY---
CLASS: AVES ORDER: STRIGIFORMES
FAMILY: STRIGIDAE GENUS: AEGOLIUS

TAXONOMIC COMMENTS:

SUBSPECIES COMMENTS: A. F. RICHARDSONI (Bonaparte) (Committee on Classification and Nomenclature 1957).

---STATUS---
GLOBAL RANK: G5 USF&WS STATUS:
STATE RANK: S3 USFS REG. 1 STATUS: SENSITIVE

STATE SPECIES DESIGNATIONS:
GAME SPECIES: COMMERCIAL SPECIES:
SPORT FISH: FUR-BEARER:
PROTECTED NON-GAME: Y PEST:

GLOBAL STATUS COMMENTS:

STATE STATUS COMMENTS:

---DISTRIBUTION---
COUNTY DISTRIBUTION:

COUNTYNAME	OCCURRENCE STATUS	MIGRATORY STATUS
Beaverhead	P	T
Flathead	P	T
Gallatin	P	T
Glacier	P	T
Granite	P	SP
Lake	P	SP
Lewis and Clark	C	SC
Lincoln	C	SC
Meagher	P	SP
Mineral	P	T
Missoula	P	T
Park	P	SP
Powell	P	T
Ravalli	C	SC
Stillwater	P	SP
Teton	P	SP

ECOREGION DISTRIBUTION:

ECOREGION	OCCURRENCE STATUS	MIGRATORY STATUS
2112M	P	SP
3112M	P	SP

WATERSHED DISTRIBUTION:

WATERSHED CODE	OCCURRENCE STATUS	MIGRATORY STATUS
100100	C	SC
100200	P	SP
100301	P	SP
100302	P	SP
100700	P	T
170101	P	T
170102	P	SP

MINIMUM ELEVATION: 4700 MAXIMUM ELEVATION: 7850

GLOBAL RANGE COMMENTS: BREEDS: cen. Alaska to n. Saşkatchewan and Labrador, south to n. British Columbia, ne. Washington, Idaho, Montana (A89HOL04NA), s. Manitoba, ne. Minnesota, and New Brunswick; also south in mountains to Colorado and New Mexico (A87HAY01NA, A87RYD01NA, A90STA03NA). See A89WHE01NA for recent records from Washington and Oregon. WINTERS: mainly in breeding range, south irregularly to n. U.S. Also in Old World.

STATE RANGE COMMENTS: Mountainous regions of western Montana concentrated along the continental divide with a few scattered in high elevation forests east of the continental divide (Fairman et al. 1990, Bergeron et al. 1992).

---MIGRATION---

NON-MIGRANT:	Y	LOCAL MIGRANT:	Y
BREEDS IN STATE:	Y	DISTANT MIGRANT:	
WINTERS IN STATE:	Y	MIGRATORY TRANSIENT:	
IRREGULAR APPEARANCE:		MIGRATION WITHIN STATE:	

GLOBAL MIGRATION COMMENTS: Periodic large-scale southward irruptions in North America, frequently in synchrony with similar movements of great gray and hawk-owl. May move to lower elevation for winter. In Colorado, some males remain at high elevations all year; others wander extensively. (B88JOH01NA).

STATE MIGRATION COMMENTS: In Idaho, owls tended to use higher elevations during summer, but overlap between seasons was complete (Hayward 1989).

---HABITAT---
MARINE:

ESTUARINE:

RIVERINE:

LACUSTRINE:

PALUSTRINE: BOG/FEN

TERRESTRIAL: FOREST
HARDWOOD
CONIFER
MIXED

SUBTERRAN:

GLOBAL SPECIAL FACTORS: STANDING SNAG/HOLLOW TREE

STATE SPECIAL FACTORS: Standing snag/hollow tree
Old growth

GLOBAL HABITAT COMMENTS: Dense coniferous forest, mixed forest, thickets of alder, aspen, or stunted spruce, most commonly in proximity to open grassy situations (B83COM01NA); muskeg bogs. Generally in spruce-fir in Rockies. Roosts in dense cover by day.

REPRODUCTIVE HABITAT COMMENTS: Nests in tree hole, natural cavity or old woodpecker hole; sometimes in artificial nest boxes (B78HAR01NA). Nest site may be used in consecutive years. Three nest holes in CO were 78-100 mm in diameter (see B88JOH01NA).

STATE HABITAT COMMENTS: Mature spruce/fir forests with multilayered canopies and a highly complex structure, at elevations greater than 1500m with a mosaic of openings or meadows (Hayward 1989). In central Idaho, owls nested in mixed conifer (40%), spruce-fir (18%) Douglas-fir (21%) and aspen stands (21%) (Hayward 1989). One nest in MT was found in a dead broken-topped subalpine fir; nest opening measured 73X64 mm (Holt and Ermatinger 1989).

---FOOD HABITS---
FOOD HABITS: CARNIVORE

GLOBAL FOOD COMMENTS: Eats mainly small mammals (often MICROTUS & CLETHRIONOMYS, also SOREX & PEROMYSCUS); also sometimes birds and insects (B388EN01NA, A87RYD01NA).

STATE FOOD COMMENTS: The red-backed vole is the main prey species in ID and CO. Other vole species taken when available along with other small rodents, birds, and insects (Palmer and Ryder 1984, Hayward 1989).

---SPECIES ECOLOGY---
GLOBAL ECOLOGY COMMENTS: In ID, annual home range avgd. 1528 ha (522-4119 ha); home ranges overlapped extensively; range larger in winter than in summer; center of winter & summer ranges separated by avg. of 2333 m (A87HAY02NA). Defends nest site only.

STATE ECOLOGY COMMENTS: Boreal owls roost at sites scattered throughout their home range, rarely in the same stand on consecutive nights or the same tree more than 2X per year; they selected cool micro-sites in summer (Hayward 1989). They roost alone, usually far from their nest and mate. Owls use a sit-and-wait hunting method (Hayward 1989).

---PHENOLOGY/SEASONALITY---
PHENOLOGY: CIRCADIAN

PRESENCE/ACTIVITY IN STATE:

month	first half	second half
JAN	A	A
FEB	A	A
MAR	A	A
APR	R	R
MAY	R	R
JUN	R	R
JUL	R	A
AUG	A	A
SEP	A	A
OCT	A	A
NOV	A	A
DEC	A	A

GLOBAL PHENOLOGY COMMENTS: May forage day or night.

STATE PHENOLOGY COMMENTS: Most hunting occurs after dark (Hayward 1989).

---REPRODUCTION---
COLONIAL/AGGREGATE BREEDER:

GLOBAL REPRODUCTION COMMENTS: IN CO, nests initiated mid-Apr. to early June. Clutch size usually 4-6. Incub. reported as 25-36 days, by female. Young fledge at ca. 4-5 wk., independent at 5-6 wk., sexually mature by 1 yr. Mating system variable. B88JOH01NA).

STATE REPRODUCTION COMMENTS: Probably breeds throughout it's range in Montana. One nest in MT fledged young 20-24 June (Holt and Ermatinger 1989). In Idaho, males start singing in late Jan., females in early Feb.; call rates increase through March. Egg laying takes place 12 Apr.-24 May. Fledging takes 27-32 days (Hayward 1989).

---MANAGEMENT---
GLOBAL MANAGEMENT COMMENTS: To detect owls in Rocky Mts.: biweekly surveys in Mar.-Apr.; minimum of 3 yr. of censusing may be needed because of low vocal activity in some yrs.; census on clear calm nights (A87PAL02NA). See A87BUL02NA for capture techniques.

STATE MANAGEMENT COMMENTS: All forested sites in the spruce-fir zone should be considered potential habitat. Snag management guidelines for pileated woodpeckers should be followed (Rodrick and Milner 1991). Maintain aspen groves with large diameter trees. Clearcuts are not considered suitable habitat for foraging, however uneven-age timber management may be compatible with boreal owls (Hayward 1989). Because of large home ranges and low population densities, planning areas should exceed 1000 sq. km of suitable habitat (Hayward 1989). Nest boxes may be used to monitor owl populations (Hayward et al. 1992).

---ADDITIONAL ATTRIBUTES---
LENGTH (cm): 25 WEIGHT (g): 167

---REFERENCES---

--SOURCECODE	--CITATION
B92BER01MTUS	Bergeron, D., C. Jones, D. L. Genter, and D. Sullivan. 1992. P. D. Skaar's Montana Bird Distribution, Fourth Edition. Special Publication No. 2. Montana Natural Heritage Program, Helena. 116 pp.
U90FAI01MTUS	Fairman, L. M., Genter, D. G. and C. Jones. 1990. An overview of the ecology of the boreal owl (AEGOLIUS FUNEREUS). Montana Natural Heritage Program, 32 pp.
U89HAY01MTUS	Hayward, G. D. 1989. Habitat use and population biology of boreal owls in the northern Rocky Mountains, USA. Ph.D. Dissertation. Univ. Idaho. 113 pp.
A91HAY01MTUS	Hayward, G. D. and P. H. Hayward. 1991. Body measurements of Boreal Owls in Idaho and a discriminant model to determine sex of live specimens. Wilson Bulletin 103:497-500.
A92HAY01MTUS	Hayward, G. D., R. K. Steinhosrt and P. H. Hayward. 1992. Monitoring boreal owl populations with nest boxes: Sample size and cost. J. Wildl. Manage. 56:777-785.
A89HOL02MTUS	Holt, D. W. and D. Ermatinger. 1989. First confirmed nest site of boreal owls in Montana. Northwestern Naturalist 70:27-31.
B86JOH01MTUS	Johnsgard, P. A. 1986. Birds of the Rocky Mountains with particular reference to national parks in the Northern Rocky Mountain region. Colorado Associated University Press, Boulder. xi + 504 pp.
U90MUL01MTUS	Mullen, P. D. 1990. Status report on boreal owl surveys in southwestern Montana, 1989. Montana Natural Heritage Program, Helena, MT. 16 pp.
UNDSKA01MTUS	Skaar, P. D. No date. [Field notes on rare birds in Montana (unpublished, unbound).]
B38BEN01NAUS	Bent, A. C. 1938. Life histories of North American birds of prey. Part 2. U.S. Nat. Mus. Bull. 170. 482 pp., 92 pls.
A87PAL02NAUS	Palmer, D. A. 1987. Annual, seasonal, and nightly variation in calling activity of boreal and northern saw-whet owls. Pp. 162-168 in Nero, R.W., et al., eds. Biol. & Cons. of n. forest owls. U.S. For. Serv., Gen. Tech Rep. RM-142.
A87RYD01NAUS	Ryder, R. A., et al. 1987. Distribution and status of the boreal owl in Colorado. Pages 169-174 in Nero, R. W., et al., eds. Biology and conservation of northern forest owls. USDA For. Serv., Gen. Tech. Rep. RM-142.
A87HAY01NAUS	Hayward, G. D., P. H. Hayward and E. O. Garton. 1987. Revised breeding distribution of the boreal owl in the northern Rocky Mountains. Condor 89:431-432.
A87NIC02NAUS	Nicholls, T. H. and M. R. Fuller. 1987. Owl telemetry techniques. Pp. 294-301 in: Nero, R. W., et al., (eds). Biology and conservation of northern forest owls. USDA Forest Service, Gen. Tech. Rep. RM-142.
A87OCO01NAUS	O'Connell, M. W. 1987. Occurrence of the boreal owl in northeastern Washington. Pp. 185-188 in Nero, R. W., et al., (eds). Biology and conservation of northern forest owls. USDA For. Serv., Gen. Tech. Rep. RM-142.
A87SMI04NAUS	Smith, D. G. 1987. Owl census techniques. Pages 304-307 in Nero, R. W., et al., eds. Biology and conservation of northern forest owls. USDA For. Serv., Gen. Tech. Rep. RM-142.

A87HAY02NAUS Hayward, G. D., et al. 1987. Movements and home range use by boreal owls in central Idaho. Pages 175-184 in Nero, R. W., et al., eds. Biology and conservation of northern forest owls. USDA For. Serv., Gen. Tech. Rep. RM-142.

B80TER01NAUS Terres, J. K. 1980. The Audubon Society encyclopedia of North American birds. Alfred A. Knopf, New York.

B78CLA01NAUS Clark, R. J., D. G. Smith, and L. H. Kelso. 1978. Working bibliography of owls of the world. National Wildl. Fed., Sci. & Tech. Ser. No. 1. 336 pp.

B83COM01NAUS AOU Committee on Classification and Nomenclature. 1983. Check-list of North American birds, 6th ed. Amer. Ornithologists Union, Allen Press, Inc., Lawrence, Kansas.

B78HAR01NAUS Harrison, C. 1978. A field guide to the nests, eggs and nestlings of North American birds. Collins, Cleveland.

A84PAL01NAUS Palmer, D. A. and R. A. Ryder. 1984. The first documented breeding of the boreal owl in Colorado. Condor 86:215-217.

B87ECK01NAUS Eckert, Allan W. 1978. The Owls of North America. Weather-vane Books, New York. 278 pp.

A87BUL02NAUS Bull, E. L. 1987. Capture techniques for owls. Pages 291-293 in Nero, R. W., et al., eds. Biology and conservation of northern forest owls. USDA For. Serv., Gen. Tech. Rep. RM-142.

B93FIS01NAUS Fisher, A. K. 1893. The hawks and owls of the United States in their relation to agriculture. Wash. U.S. Dept. of Agric. Bull. no. 6. 210 pp.

B88JOH01NAUS Johnsgard, P. 1988. North American owls: biology and natural history. Smithsonian Inst. Press. 336 pp.

B89VOO01NAUS Voous, K. H., and A. Cameron. 1989. Owls of the Northern Hemisphere. MIT Press, Cambridge, Massachusetts. 320 pp.

A89WHE01NAUS Whelton, B. D. 1989. Distribution of the boreal owl in eastern Washington and Oregon. Condor 91:712-716.

B87PEN01NAUS Pendleton, B. A. Giron, et al. 1987. Raptor management techniques manual. National Wildlife Federation, Sci. and Tech. Ser. No. 10. 420 pp.

A90STA03NAUS Stahlecker, D. W., and J. J. Rawinski. 1990. First records for the boreal owl in New Mexico. Condor 92:517-519.

A89HOL04NAUS Holt, D. W. and D. Ermatinger. 1989. First confirmed nest site of boreal owls in Montana. Northwest. Nat. 70:27-31.

A89WIE01NAUS Wiens, T. P. 1989. Spring migrant boreal owls at Whitefish Point, Michigan. Jack-Pine Warbler 67:88-93.

OTUS FLAMMEOLUS
FLAMMULATED OWL

AUTHORITY: (Kaup, 1853)
HERITAGE REFERENCE: ABNSB01020

---TAXONOMY---
CLASS: AVES ORDER: STRIGIFORMES
FAMILY: STRIGIDAE GENUS: OTUS

TAXONOMIC COMMENTS: O. SCOPS and O. FLAMMEOLUS have been considered conspecific by some authors (B80TER01NA).

SUBSPECIES COMMENTS: O.F. FLAMMEOLUS (Kaup) (Committee on Classification and Nomenclature 1957).

---STATUS---
GLOBAL RANK: G4 USF&WS STATUS:
STATE RANK: S1S3B,SZ USFS REG. 1 STATUS: SENSITIVE

STATE SPECIES DESIGNATIONS:
GAME SPECIES: COMMERCIAL SPECIES:
SPORT FISH: FUR-BEARER:
PROTECTED NON-GAME: Y PEST:

GLOBAL STATUS COMMENTS:

STATE STATUS COMMENTS: No Breeding Bird Survey records in MT, but the few records from elsewhere indicate a significant decline (Dobkin 1992).

---DISTRIBUTION---
COUNTY DISTRIBUTION:

COUNTYNAME	OCCURRENCE STATUS	MIGRATORY STATUS
Flathead	C	SC
Lewis and Clark	C	T
Missoula	P	SP
Ravalli	P	SP

ECOREGION DISTRIBUTION:

ECOREGION	OCCURRENCE STATUS	MIGRATORY STATUS
211?M	P	T
311?M	P	T

WATERSHED DISTRIBUTION:

WATERSHED CODE	OCCURRENCE STATUS	MIGRATORY STATUS
100301	C	SC
170102	P	S?

MINIMUM ELEVATION: MAXIMUM ELEVATION:

GLOBAL RANGE COMMENTS: BREEDS: locally from s. and se. British Columbia, n.-cen. Washington, e. Oregon, Idaho, w. Montana, and n. Colorado south to s. California, s. Arizona, s. New Mexico, and w. Texas; also cen. Mexico. WINTERS: cen. Mexico south in highlands to Guatemala and El Salvador, casually north to s. California.

STATE RANGE COMMENTS: All records in western MT; 3 breeding records for the state (Bergeron et al. 1992). May be more common in W MT than is currently known (Holt and Hillis 1987).

---MIGRATION---
NON-MIGRANT: LOCAL MIGRANT:
BREEDS IN STATE: Y DISTANT MIGRANT: Y
WINTERS IN STATE: MIGRATORY TRANSIENT: Y
IRREGULAR APPEARANCE: Y MIGRATION WITHIN STATE:

GLOBAL MIGRATION COMMENTS: Apparently migratory, at least in northern part of range. Arrives in breeding areas in cen. Colorado in early May (A87REY02NA). In several western U.S. states, arrives generally in April, departs by end of October (B89V0001NA).

STATE MIGRATION COMMENTS:

---HABITAT---
MARINE:

ESTUARINE:

RIVERINE:

LACUSTRINE:

PALUSTRINE:

TERRESTRIAL: FOREST
HARDWOOD
CONIFER
MIXED

SUBTERRAN:

GLOBAL SPECIAL FACTORS: STANDING SNAG/HOLLOW TREE

STATE SPECIAL FACTORS:

GLOBAL HABITAT COMMENTS: Montane forest; associated mainly with ponderosa or jeffrey pine, often intermixed with aspen in north, oaks in south; Douglas-fir in British Columbia; also in aspen and, locally, spruce-fir and lodgepole pine-red fir; areas with warm dry summer. Migration: wooded areas in lowlands and mountains. Prefers old growth.

REPRODUCTIVE HABITAT COMMENTS: Usually nests in an abandoned woodpecker hole, often in aspen or pine tree. In New Mexico, prefers nesting areas that have low shrub density, high canopy height, and high importance of mature PINUS EDULIS; vegetation characteristics apparently more limiting than nest-tree characteristics (A88MCC03NA). In Colorado, individuals generally occupied same breeding territory in successive years (males more so than females) (A87REY01NA). May nest in nest boxes, including those erected for kestrels, Abert's squirrels, or those especially designed for owls (see B89V0001NA). See A90BUL01NA for information on nesting habitat in Oregon.

STATE HABITAT COMMENTS: In Idaho, found most commonly in mature douglas-fir and ponderosa pine stands with relatively open canopies (Atkinson and Atkinson 1990). One nest cavity, excavated by a northern flicker, was in 6.5 m tall, 34 cm dbh, Douglas-fir snag (Atkinson and Atkinson 1990). In NE OR nest trees were located in stands of old-growth ponderosa pine or mixed conifers near small clearings (Bull and Anderson 1978).

---FOOD HABITS---
FOOD HABITS: INVERTIVORE

GLOBAL FOOD COMMENTS: Feeds on various insects (e.g. moths, beetles, grasshoppers, crickets, caterpillars); rarely eats small mammals or birds. Foraging tactics include hawk-gleaning, hawking, hover-gleaning, and drop-pouncing (A87REY02NA).

STATE FOOD COMMENTS:

---SPECIES ECOLOGY---
GLOBAL ECOLOGY COMMENTS: Nesting home ranges in Colorado averaged 14 ha; foraging activity concentrated in 1-4 areas within home range

(A87REY02NA). Generally fewer than 4 singing males per 40 ha in Oregon, British Columbia, and Colorado. Density of 5.3 males per sq. km reported from California (B88JOH01NA).

STATE ECOLOGY COMMENTS: May be semi-colonial (Atkinson and Atkinson 1990, Rodrick and Milner 1991)). Densities of singing males in Idaho averaged 0.41/40 ac (Atkinson and Atkinson 1990). Both sexes make extra-range movements during breeding season (Reynolds and Linkhart 1990).

---PHENOLOGY/SEASONALITY---
PHENOLOGY: NOCTURNAL
CREPUSCULAR

PRESENCE/ACTIVITY IN STATE:

month	first half	second half
JAN		
FEB		
MAR		
APR		
MAY		R
JUN	R	R
JUL	R	R
AUG	R	R
SEP		
OCT		
NOV		
DEC		

GLOBAL PHENOLOGY COMMENTS: During nesting period in Colorado, foraging activity peaked 15-30 min after sunset and 1-1.5 hr before sunrise; ceased activity during snow or rain (A87REY02NA).

STATE PHENOLOGY COMMENTS: Phenology for state is very poorly known. Breeding records with young seen from July and Aug. Four fall and winter observations are from Oct, Nov, Jan, Feb (Wright 1976, Skaar, unpubl. field notes). In Salmon NF, Idaho, owls arrived in early May (Atkinson and Atkinson 1990). Calling very common at dusk (Atkinson and Atkinson 1990).

---REPRODUCTION---
COLONIAL/AGGREGATE BREEDER:

GLOBAL REPRODUCTION COMMENTS: See B88JOH01NA for review of egg dates. Clutch size 2-4 (usually 3); incub. 21-22 nights, by female (male brings food); nestling period reported as 22-24 nights and 21-23 days; fledglings tended by both parents (divide brood, Colorado).

STATE REPRODUCTION COMMENTS: In Idaho, one nest fledged between 19-22 July (Atkinson and Atkinson 1990). In NE OR incubation ranged from 8 June to 3 July; fledging occurred between 25 July and 16 Aug. (Bull and Anderson 1978).

---MANAGEMENT---
GLOBAL MANAGEMENT COMMENTS: See A84REY01NA for capture and monitoring methods, A87REY03NA for census methods.

STATE MANAGEMENT COMMENTS: Management recommendations have been given by Rodrick and Milner (1991), Atkinson and Atkinson (1990). They include: provide public education about this spp; maintain stands of dense mature trees near brushy clearings; maintain at least 8 snags > 30 cm dbh and > 1.8 m tall per 40 ha; ensure snag recruitment; do not apply insecticides in owl areas; design and implement research programs to describe breeding biology and habitat use. In MT, surveys are needed to determine range in the state.

---ADDITIONAL ATTRIBUTES---
LENGTH (cm): 17 WEIGHT (g): 57

---REFERENCES---

--SOURCECODE	--CITATION
U90ATK01MTUS	Atkinson, E. C. and M. L. Atkinson. 1990. Distribution and status of Flammulated Owls (Otus flammeolus) on the Salmon National Forest. Idaho Nat. Heritage Preg., Idaho Dept. Fish Game, Salmon Natl. For. [Unpubl. Rep.] 25 pp. + appendices.
B92BER01MTUS	Bergeron, D., C. Jones, D. L. Genter, and D. Sullivan. 1992. P. D. Skaar's Montana Bird Distribution, Fourth Edition. Special Publication No. 2. Montana Natural Heritage Program, Helena. 116 pp.
A78BUL01MTUS	Bull, E. L., and R. G. Anderson. 1978. Notes on Flammulated Owls in northeastern Oregon. Murrelet 59:26-28.
N92DOB01MTUS	Dobkin, D. S. 1992. Neotropical migrant landbirds in the Northern Rockies and Great Plains. U.S.D.A. For. Serv. N. Region Publ. R1-93-34. Missoula, Mont.
A87HOL02MTUS	Holt, D. W. and J. M. Hillis. 1987. Current status and habitat associations of forest owls in western Montana. Pp 281-288 in: Biology and conservation of northern forest owls: symposium proceedings, Feb. 3-7, Winnepeg, Manitoba. Gen. Tech. Rep. RM-142. Fort Collins, CO. USDA, Forest Service.
A90REY01MTUS	Reynolds, R. T. and B. D. Linkhart. 1990. Longevity records for male and female flammulated owls. J. Field Ornithol. 61:243-244.
A90REY02MTUS	Reynolds, R. T. and B. D. Linkhart. 1990. Extra-pair copulation and extra-range movements in flammulated owls. Ornis Scandinavica 21:74-77.
B83ROB01MTUS	Robbins, C. S., B. Bruun and H. S. Zim. 1983. A guide to field identification. Birds of North America. Golden Press, New York. 360 pp.
U91ROD01MTUS	Rodrick, E. and R. Milner (eds). 1991. Management recommendations for Washington's priority habitats and species. Wash. Dept. Wildl., Olympia. [Unpubl. Rep.]
UNDSKA01MTUS	Skaar, P. D. No date. [Field notes on rare birds in Montana (unpublished, unbound).]
A76WRI01MTUS	Wright, P. L. 1976. Further bird records from western Montana. Condor 78:418-420.
A87REY02NAUS	Reynolds, R. T. and B. D. Linkhart. 1987. The nesting biology of flammulated owls in Colorado. Pp. 239-248 in: Nero, R.W., et al., (eds). Biology and conservation of northern forest owls. USDA For. Serv., Gen. Tech. Rep. RM-142.
B74WAL01NAUS	Walker, Lewis Wayne. 1974. The book of owls. Alfred A. Knopf, Inc. New York. 255 pp.
A87NIC02NAUS	Nicholls, T. H. and M. R. Fuller. 1987. Owl telemetry techniques. Pp. 294-301 in: Nero, R. W., et al., (eds). Biology and conservation of northern forest owls. USDA Forest Service, Gen. Tech. Rep. RM-142.
B78HAR01NAUS	Harrison, C. 1978. A field guide to the nests, eggs and nestlings of North American birds. Collins, Cleveland.
A87REY03NAUS	Reynolds, R. T. 1987. Census of flammulated owls. Pages 308-309 in Nero, R. W., et al., eds. Biology and conservation of northern forest owls. USDA For. Serv., Gen.Tech. Rep. RM-142.
A87REY01NAUS	Reynolds, R. T. and B. D. Linkhart. 1987. Fidelity to territory and mate in flammulated owls. Pp. 234-238 in: Nero, R. W., et al. (eds). Biology and conservation of northern forest owls. USDA For. Serv., Gen. Tech. Rep. RM-142.
B78CLA01NAUS	Clark, R. J., D. G. Smith, and L. H. Kelso. 1978. Working bibliography of owls of the world. National Wildl. Fed., Sci. & Tech. Ser. No. 1. 336 pp.
B88JOH01NAUS	Johnsgard, P. 1988. North American owls: biology and natural history. Smithsonian Inst. Press. 336 pp.

A75BAL01NAUS Balda, R. P., McKnight, B. C. and C. D. Johnson. 1975. Flammulated owl migration in the southwestern United States. Wilson Bull. 87(4):520-33.

B83COM01NAUS AOU Committee on Classification and Nomenclature. 1983. Check-list of North American birds, 6th ed. Amer. Ornithologists Union, Allen Press, Inc., Lawrence, Kansas.

B80TER01NAUS Terres, J. K. 1980. The Audubon Society encyclopedia of North American birds. Alfred A. Knopf, New York.

A84REY01NAUS Reynolds, R. T. and B. D. Linkhart. 1984. Methods and materials for capturing and monitoring flammulated owls. Great Basin Nat. 44:49-51.

B83NAT01NAUS National Geographic Society. 1983. Field guide to the birds of North America. National Geographic Society, Washington, D.C. 464 pp.

B87ECK01NAUS Eckert, Allan W. 1978. The Owls of North America. Weather-vane Books, New York. 278 pp.

A88MCC03NAUS McCallum, D. A. and F. R. Gehlbach. 1988. Nest-site preferences of flammulated owls in western New Mexico. Condor 90:653-661.

B89VOO01NAUS Voous, K. H., and A. Cameron. 1989. Owls of the Northern Hemisphere. MIT Press, Cambridge, Massachusetts. 320 pp.

B87PEN01NAUS Pendleton, B. A. Giron, et al. 1987. Raptor management techniques manual. National Wildlife Federation, Sci. and Tech. Ser. No. 10. 420 pp.

A90REY01NAUS Reynolds, R. T. and B. D. Linkhart. 1990. Extra-pair copulation and extra-range movements in flammulated owls. Ornis Scandinavica 21:74-77.

A90BUL01NAUS Bull, E. L., A. L. Wright, and M. G. Henjum. 1990. Nesting habitat of flammulated owls in Oregon. J. Raptor Res. 24:52-55.

GULO GULO
WOLVERINE

AUTHORITY: (Linnaeus, 1758)
HERITAGE REFERENCE: AMAJF03010

---TAXONOMY---
CLASS: MAMMALIA ORDER: CARNIVORA
FAMILY: MUSTELIDAE GENUS: GULO

TAXONOMIC COMMENTS: Some authors (e.g., Hall 1981) have regarded the North American wolverine as a species (GULO LUSCUS) distinct from the Eurasian wolverine (GULO GULO). Most recent accounts (e.g., Jones et al. 1992; Wozencraft, in Wilson and Reeder 1993) generally treat LUSCUS as a subspecies of GULO GULO, following Degerbol (1935) and Kurten and Rausch (1959).

SUBSPECIES COMMENTS: None; monotypic (Hall 1981).

---STATUS---
GLOBAL RANK: G4 USF&WS STATUS: C2NL
STATE RANK: S4? USFS REG. 1 STATUS: SENSITIVE

STATE SPECIES DESIGNATIONS:
GAME SPECIES: COMMERCIAL SPECIES:
SPORT FISH: FUR-BEARER: Y
PROTECTED NON-GAME: PEST:

GLOBAL STATUS COMMENTS: Status is little known, especially in the mountains of the U.S. south of Canada; difficult to study. Numbers apparently declined steadily in the U.S. beginning in the latter half of the 1800s, due to fur trapping. Habitat has been degraded through timber harvesting, ski area construction, road construction, and general human disturbance (Biosystems Analysis 1989). Apparently has made a comeback in recent years in several western states; outside of Alaska, Montana has the largest population in the U.S. (see Wilson 1982). Sometimes regarded as a nuisance; may rob traplines or destroy human food caches. Was intensively hunted in Scandanavia because of alleged predation on domestic reindeer (Nowak 1991). Subspecies KATSCHEMAKENSIS of Alaska's Kenai Peninsula totaled about 50 individuals in the 1980s; apparently was declining due to an excessively long hunting season (see Nowak 1991).

STATE STATUS COMMENTS: Restricted harvest--take one with permit.

---DISTRIBUTION---
COUNTY DISTRIBUTION:

COUNTYNAME	OCCURRENCE STATUS	MIGRATORY STATUS
Beaverhead	P	YP
Broadwater	P	YP
Carbon	P	YP
Deer Lodge	P	YP
Flathead	P	YP
Gallatin	P	YP
Glacier	P	YP
Granite	P	YP
Jefferson	P	YP
Judith Basin	P	YP
Lake	P	YP
Lewis and Clark	P	YP
Lincoln	P	YP
Madison	P	YP
Meagher	P	YP
Missoula	P	YP
Park	P	YP
Powell	P	YP
Ravalli	P	YP
Sanders	P	YP
Silver Bow	P	YP
Teton	P	YP

ECOREGION DISTRIBUTION:

ECOREGION	OCCURRENCE STATUS	MIGRATORY STATUS
2112M	P	YP
3112M	P	YP

WATERSHED DISTRIBUTION:

WATERSHED CODE	OCCURRENCE STATUS	MIGRATORY STATUS
100100	P	YP
100200	P	YP
100301	P	YP
100302	P	YP
100401	P	YP
100402	P	YP
100500	P	YP
100700	P	YP
100800	P	YP
170101	P	YP
170102	P	YP

MINIMUM ELEVATION: MAXIMUM ELEVATION:

GLOBAL RANGE COMMENTS: Holarctic; northern Europe, Asia, and North America. Historic range in North America: arctic islands to the mountains of California, Colorado and Utah, and parts of the northcentral and northeastern U.S. (where records are sketchy and scarce); extirpated from most of the southern part of the range, including all of the northcentral and northeastern U.S. and most of southeastern and south-central Canada. See Wilson (1982) for a state-by-state review of occurrence in the U.S. In California, recorded at elevations of 400-4300 m (average 2425 m) (California DF&G 1990, Wilson 1982).

STATE RANGE COMMENTS: Nearly extinct: 1920-1940. Increasing # and range since. "Recovery" originated in NW MT-Glacier Park area and spread from there (Newby and Wright 1955, Newby and McDougal 1964). Current distribution in Thompson (1982). May exhibit dispersal movements in/thru atypical habitat.

---MIGRATION---

NON-MIGRANT: Y	LOCAL MIGRANT: Y
BREEDS IN STATE: Y	DISTANT MIGRANT:
WINTERS IN STATE: Y	MIGRATORY TRANSIENT:
IRREGULAR APPEARANCE:	MIGRATION WITHIN STATE: Y

GLOBAL MIGRATION COMMENTS: In Alaska, moves to lower elevations in winter (Whitman et al. 1986).

STATE MIGRATION COMMENTS: Seasonal ranges were all within large home range; higher elevations used in summer, lower in winter (Hornocker and Hash 1981). Dispersal movements of > 300 km are known (Magoun 1985, Gardner et al. 1986).

---HABITAT---

MARINE:

ESTUARINE:

RIVERINE:

LACUSTRINE:

PALUSTRINE:

TERRESTRIAL: FOREST - CONIFER
WOODLAND - CONIFER
SHRUBLAND/CHAPARRAL
TUNDRA
GRASSLAND/HERBACEOUS
ALPINE

SUBTERRAN: SUBTERRESTRIAL

GLOBAL SPECIAL FACTORS: FALLEN LOG/DEBRIS
BURROWING IN OR USING SOIL

STATE SPECIAL FACTORS:

GLOBAL HABITAT COMMENTS: Alpine and arctic tundra, boreal and mountain forests (primarily coniferous). Limited to mountains in the south. Partial to marshy areas. Usually in areas with snow on the ground in winter. Most often seen above timberline. When inactive, occupies den in cave, rock crevice, under fallen tree, in thicket, or similar site. Terrestrial and may climb trees.

REPRODUCTIVE HABITAT COMMENTS: Young are born in a den among rocks or tree roots, in hollow log, under fallen tree, or in dense vegetation, including sites under snow.

STATE HABITAT COMMENTS: In MT, Hornocker and Hash (1981) found most wolverine use in medium to scattered timber, while areas of dense, young timber were used least. Wolverines avoided clearcuts and burns, crossing them rapidly and directly when they were entered at all. Hash (1987) reported wolverines in the N Rocky Mtn region were associated with fir, pine, and larch. Aspen stands were also used, as were cottonwoods in riparian areas. Ecotonal areas appeared to be important habitat components (Hash 1987). Hatler (1989) believed wolverines are not dependant on any particular vegetative habitat type. Banci (1986) reported "habitat requirements appear to be large, isolated tracts of wilderness supporting a diverse prey base, rather than specific plant associations or topography." South of the boreal forest, most habitat descriptions in the literature agree with Grove's (1988) characterization of "large, mountainous, and essentially roadless areas."

---FOOD HABITS---
FOOD HABITS: CARNIVORE

GLOBAL FOOD COMMENTS: Opportunistic. Feeds on a wide variety of roots, berries, small mammals, birds' eggs, fledglings, and fish. May attack moose, caribou, and deer hampered by deep snow. Small and medium size rodents and carrion (especially ungulate carcasses) often make up a large percentage of the diet. Prey are captured by pursuit, ambush, or digging out dens (Biosystems Analysis 1989). May cache prey in fork of tree branches or under snow.

STATE FOOD COMMENTS: Carrion is a significant food source throughtout its range (Hornocker and Hash 1981, Gardner 1985, Banci 1987, Magoun 1987). In MT: Winter: elk, deer, dead horses and cows, mustelids, snowshoe hares, marmots, birds, small mammals, porcupines. Summer: probably small mammals, insects, eggs, berries, carrion (Hornocker and Hash 1981). Hatler (1989) lists all foods found in the literature. Wolverines will cache excess food for use at a later time.

---SPECIES ECOLOGY---
GLOBAL ECOLOGY COMMENTS: Solitary and wide ranging. Occurs at relatively low population densities (e.g., minimum of 20 per 1300 sq km in Montana). Home range of male larger than that of female. Mean annual home range of males was 535 sq km in Alaska, 422 sq km in Montana; of females, 105 sq km in Alaska, 100 sq km in Montana. Males in some areas apparently are territorial, but in Montana there was extensive overlap of the ranges of both the same and opposite sexes. Apparently territory/range size depends on availability of denning sites and food supply (see Wilson 1982). Some individuals travel regularly over the same route (Wilson 1982). Availably evidence indicates that juveniles disperse usually around 30-100 km from their natal range. There are no important predators other than humans. See Whitman et al. (1986).

STATE ECOLOGY COMMENTS: Makes extensive movements. Average yr range--male: 422 sq km, female: 388 sq km. Lactating females during spring/summer: 100 sq km. Estimated population density of 1 per 65 km2 (25 sq mi) in S. Fork Flathead drainage (Hornocker and Hash 1981). Non-territorial but exhibits scent marking behav. (Koehler et al. 1980). In MT, Hornocker and Hash (1981) found substantial overlap between territories of both the same and opposite sexed animals. In othr areas it is thought wolverines maintain sigle sex territories, with male territories overlapping female territories (Gardner 1985, Magoun 1985, Banci 1987). Most adult mortality is human caused (Hornocker and Hash 1981, Hash 1987).

---PHENOLOGY/SEASONALITY---
PHENOLOGY: CIRCADIAN
NOCTURNAL

PRESENCE/ACTIVITY IN STATE:

month	first half	second half
JAN	A	A
FEB	A	A
MAR	R	A
APR	R	R
MAY	R	R
JUN	R	R
JUL	R	R
AUG	A	A
SEP	A	A
OCT	A	A
NOV	A	A
DEC	A	A

GLOBAL PHENOLOGY COMMENTS: Active throughout the year. Active both day and night but primarily nocturnal.

STATE PHENOLOGY COMMENTS: May use less carrion in spring and summer when a wide variety of food is available. Active in winter (Hornocker and Hash 1981).

---REPRODUCTION---
COLONIAL/AGGREGATE BREEDER:

GLOBAL REPRODUCTION COMMENTS: Breeds April-October, usually in summer. Implantation delayed generally until winter. Gestation 7-9 months; active gestation 30-40 days. One to six (usually 2-4) young are born January-April, mainly February or March (reportedly April-June in the Pacific states, Ingles 1965). Young weaned beginning at about 7-8 weeks, separate from the mother in the fall. Sexually mature generally in the second or third year. Males sexually mature sometimes as yearlings (Alaska and Yukon); males over three years old were sexually mature in British Columbia. Some females mature at 12-15 months and produce their first litter when two years old. (Wilson 1982). In British Columbia, most mature females were reproductively active. Lives to an age of up to about 10 years, or sometimes 15-18 years or so.

STATE REPRODUCTION COMMENTS: Females may be reprod. inactive for 1-3 yrs (Hornocker and Hash 1981). Den sites probably under stumps, brush piles, talus, etc. Mother stays in den area approximately 4-6 weeks (Hornocker pers. comm.). Female first breeds 1-2 yr, male at 14-16 months (Wright 1977).

---MANAGEMENT---
GLOBAL MANAGEMENT COMMENTS:

STATE MANAGEMENT COMMENTS: Maintaining wilderness and roadless areas is critical to a

healthy population. In timber harvest areas, roads should be minimized. Management programs must be on a regional, rather than local, level due to low wolverine population densities and wide movements (Hornocker and Hash 1981). Any harvest programs should be directed only at viable populations with surplus animals (Hash 1987). Survey techniques are summarized by McKay (1991) and Butts (1992).

---ADDITIONAL ATTRIBUTES---
LENGTH (cm): 100 WEIGHT (g): 15000

---REFERENCES---

--SOURCECODE	--CITATION
A86BAN01MTUS	Banci, V. 1986. The wolverine in the Yukon: myths and management. Discovery 15:134-137.
U87BAN01MTUS	Banci, V. A. 1987. Ecology and behavior of wolverine in Yukon. M.S. Thesis. University British Columbia, Vancouver. 178 pp.
A84FLA01MTUS	Flath, D. L. 1984. Vertebrate species of special interest or concern. Mammals, birds, reptiles, amphibians, fishes. Spec. Publ. MT DFWP. Helena, 76 pp.
U85GAR01MTUS	Gardner, C. L. 1985. The ecology of wolverines in southcentral Alaska. M.S. Thesis. University Alaska, Fairbanks. 82 pp.
A86GAR01MTUS	Gardner, C. L., W. B. Ballard and R. H. Jessup. 1986. Long distance movements by an adult wolverine. J. Mammal. 67:603.
A88GRO01MTUS	Groves, C. R. 1988. Distribution of the wolverine in Idaho as determined by mail questionnaire. Northw. Sci. 62:181-185.
A87HAS01MTUS	Hash, H. S. 1987. Wolverine. Pp. 574-585 in: M. Novak, J. Baker, M. Obbard and B. Malloch (eds.), Wild furbearer management in North America. Ministry Nat. Res., Ontario.
N89HAT01MTUS	Hatler, D. F. 1989. A wolverine management strategy for British Columbia. British Col. Ministry of Environment, Victoria, Wildl. Bull. B-60. 124 pp.
A81HOR01MTUS	Hornocker, M. G., and H. S. Hash. 1981. Ecology of the wolverine in northwestern Montana. Can. J. Zool. 59(7):1286-1301.
PNDHOR01MTUS	Hornocker, Maurice G. Wildlife Research Institute, P.O. Box 3246, University Station Moscow, Idaho 83843. (208) 885-6871.
A80KOE01MTUS	Koehler, G. M., Hornocker, M. G. and H. S. Hash. 1980. Wolverine marking behavior. Can. Field Nat. 94:339-341.
N91MCK01MTUS	McKay, R. 1991. Biological assessment and inventory plan for the wolverine (GULO GULO) in the Uinta Mountains. Utah Nat. Res., Salt Lake City. 58 pp.
B74MUR01MTUS	Murie, O. J. 1974. A field guide to animal tracks. peterson Field Guide Series #9, Houghton Mifflin Co., Boston, Mass.
A64NEW01MTUS	Newby, F. E. and J. J. McDougal. 1964. Range extension of the wolverine in Montana. J. Mammal. 45:485-487.
A55NEW01MTUS	Newby, F. E. and P. L. Wright. 1955. Distribution and status of the wolverine in Montana. J. Mammal. 36:248-253.
A86THO01MTUS	Thompson, L. S. 1982. Distribution of Montana amphibians, reptiles, and mammals. Montana Audubon Council. 24 pp.
U77WRI01MTUS	Wright, P. L. 1977. Summary of reproductive cycles of some North American mammals displaying delayed implantation. Hand-out for Zoology 309, University of Montana.
B79HAM01NAUS	Hamilton, William J., Jr. and John O. Whitaker, Jr. 1979. Mammals of the eastern United States. Cornell University Press. Ithaca, NY. 346 pp.
B81HAL01NAUS	Hall, E. R. 1981. The mammals of North America, 2nd edition, 2 vols., John Wiley and Sons, New York.
B83JON01NAUS	Jones, J. K., Jr., D. M. Armstrong, R. S. Hoffmann and C. Jones. 1983. Mammals of the northern Great Plains. University of Nebraska Press, Lincoln. 379 pp.
B74BAN01NAUS	Banfield, A. W. F. 1974. The mammals of Canada. University of Toronto Press, Toronto.
A72SAR01NAUS	Sargeant, A. B. and D. W. Varner. 1972. Movements and denning habits of a badger. J. Mamm. 53:207-210.

A75VAN01NAUS van Zyll de Jong, C.G. 1975. The distribution and abundance of the wolverine (Gulo gulo) in Canada. Canadian Field-Nat.,89(4):431-437.

A79HAL01NAUS Halfpenny, J. C., et. al. 1979. A bibliography of mustelids. Part IV: Wolverine. Michigan State Univ., Agric. Exp. Sta., Jour. Art. No. 9214. 121 pp.

A86WHI01NAUS Whitman, J. S., W. B. Ballard, and C. L. Gardner. 1986. Home range and habitat use by wolverines in southcentral Alaska. J. Wildl. Manage. 50:460-463.

A87MAG01NAUS Magoun, A. J. 1987. Summer and winter diets of wolverines, GULO GULO, in arctic Alaska. Canadian Field-Nat. 101:392-397.

U90CAL01NAUS California Department of Fish and Game. 1990. 1989 annual report on the status of California's state listed threatened and endangered plants and animals. 188 pp.

B65ING01NAUS Ingles, L. G. 1965. Mammals of the Pacific States. Stanford University Press, Stanford.

A82WIL04NAUS Wilson, D. E. 1982. Wolverine GULO GULO. Pages 644-652 in J. A. Chapman and G. A. Feldhamer, editors. Wild mammals of North America: biology, management, and economics. Johns Hopkins Univ. Press, Baltimore. 1147 pp.

B91NOW01NAUS Nowak, R. M. 1991. Walker's mammals of the world. Fifth edition. Vols. I and II. Johns Hopkins Univ. Press, Baltimore. 1629 pp.

B89BIO01NAUS Biosystems Analysis, Inc. 1989. Endangered species alert program manual--species accounts and procedures. Southern California Edison Environmental Affairs Division.

A77JOH01NAUS Johnson, R. E. 1977. An historical analysis of wolverine abundance and distribution in Washington. Murrelet 58:13-16.

B92JON01NAUS Jones, J. K., Jr., et al. 1992. Revised checklist of North American mammals north of Mexico, 1991. Occas. Pap. Mus., Texas Tech Univ. (146):1-23.

B93WIL01NAUS Wilson, D. E., and D. M. Reeder, editors. 1993. Mammal species of the world: a taxonomic and geographic reference. Second edition. Smithsonian Inst. Press, Washington. xviii + 1206 pp.

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